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The Research Quarter

of the

American Physical Education Asso

VOL. VI OCTOBER, 193

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Constitution and By-Laws of the American Physical Education Association

THE Constitution and By-Laws here presented are a revision of the fifth Constitution and By-Laws of the Association, which were drawn up in 1930 by a committee of twenty-one members, with Dr. C. L. Brownell as chairman, and approved by the National Council in December, 1930. This Constitution was admirably adapted for the rapidly growing Association, and only minor changes have been suggested during the past five years while it has been in operation. In order to bring together any changes that seemed in the nature of improvement and to embody them in the Constitution by Legislative Council enactment, Miss Coleman in 1933 appointed a committee consisting of Marjorie Bouvé, W. G. Moorhead, John F. Bovard, Jackson Sharman, C. H. McCloy, Mary C. Coleman, and W. R. LaPorte, Chairman, to accomplish the necessary revision. A tentative report was prepared and discussed at the Council meetings at Cleveland in 1933 and a revised report was then prepared embodying the report of these discussions. Professor LaPorte resigned in 1934, and Dr. McCloy succeeded him. The revised Constitution and By-Laws were passed by the Legislative Council at Pittsburgh, April, 1935, and became effective immediately. The changes made can be noted by comparison with the original Constitution printed in the *Journal of Health and Physical Education* for March, 1932, page 42. The chief changes are in the By-Laws: Article II, Section 7; Article III, Sections 1, 2, 3, 5 (added); and Article VIII, Section 3. Additional changes are in wording, and in addition of the names of one new district, one affiliated organization (change of title), two sections, and life membership to the appropriate articles.

Great thanks are due the members of the two committees, and also to Dr. Brownell, Mr. LaPorte, and Dr. McCloy for their untiring service in completing this prodigious task and providing the Association with the specifications for a most efficient form of government for its expanding needs.

Immediately following the Constitution will be found the report of the Committee on Precedents and Traditions of the Association, which was also approved by the Legislative Council at Pittsburgh. It was considered timely and expedient to publish these two reports together at this time for the information of the members of the Association. They will be reprinted later in convenient form for distribution as needed.

CONSTITUTION

ARTICLE I. NAME

Section 1.—The organization shall be called the American Physical Education Association.

ARTICLE II. AIMS

Section 1.—The aims of the Association relate to health and physical education and are:

a) To awaken and promote a wide and intelligent interest.

b) To acquire and disseminate accurate information.

c) To provide such means of promotion as will secure an adequate program.

ARTICLE III. DIVISIONS

Section 1.—The Association shall include Districts, States, and Provinces upon the basis of geographical location, Sections and Affiliated Organizations as hereinafter provided.

ARTICLE IV. MEMBERSHIP

Section 1.—The Association shall consist of members and patrons as hereinafter provided.

ARTICLE V. GOVERNMENT

Section 1.—The business of the Association shall be conducted by a Legislative Council, a Governing Board, and an Executive Committee each constituted as hereinafter provided.

ARTICLE VI. HONOR AWARDS

Section 1.—Honor Awards may be given for meritorious service as provided in the by-laws.

ARTICLE VII. PUBLICATIONS

Section 1.—The official publication shall be called the *Journal of Health and Physical Education,* published and distributed as hereinafter provided.

Section 2.—The Association shall publish and distribute a RESEARCH QUARTERLY and such other materials as may be authorized by the Legislative Council and as hereinafter provided.

ARTICLE VIII. AMENDMENTS

Section 1.—Amendments to this constitution may be proposed at any annual meeting of the Legislative Council by any member of the Council, and when so proposed shall be published in the next number of the *Journal,* and after publication shall be subject to a mail vote of the Council. An affirmative vote of three-fourths of the entire membership of the Council shall be necessary for the adoption of the proposed amendment or amendments. No vote shall be valid beyond thirty days after the date of official notification.

BY-LAWS

Article I. Membership

Section 1.—Membership in the Association shall be designated as active, professional, sustaining, student, honorary, and patron. (A professional life membership is available under the provisions of Section 9.)

Section 2.—Active members shall consist of teachers and administrators of health and physical education including research, athletic, and recreational activities.

Section 3.—Professional and sustaining members shall be the same as active members except as defined in section 9 of this article.

Section 4.—Student members shall include: students attending professional and teacher-training institutions preparing for health and physical education (not including those attending summer sessions); and persons who have completed such training but who are not actively engaged in professional work.

Section 5.—Honorary members shall be persons elected to membership in the Association upon a basis of outstanding and meritorious service in physical education or closely related fields. Candidates for honorary membership shall be nominated by a member of the Legislative Council at its regular annual meeting and for election must receive the affirmative vote of three-fourths of that body, secured through mail vote. Honorary members shall receive all official publications of the Association without charge.

Section 6.—Any person or organization may become a patron upon payment of $100.00 or more to the Association. Patrons shall receive all official publications of the Association without additional charge.

Section 7.—Active, professional, sustaining, and student members shall be approved by the Secretary acting upon the formal application of the candidate.

Section 8.—Only active, professional, sustaining members and patrons shall have the right to hold office or to vote in the election of members for the Legislative Council as hereinafter provided.

Section 9.—The annual dues for active members shall be $2.00; professional members $5.00; sustaining members $10.00; and student members $1.50. The annual dues shall begin with the month and year designated by the candidate. The professional life membership fee shall be $80.00. Active and student members shall receive the official journal. Professional and sustaining members and patrons shall receive all official publications of the Association.

Section 10.—Libraries and reading clubs may secure all official publications of the Association through the payment of $5.00 annually.

Section 11.—Any person who fails to pay dues for one-half year shall be automatically removed from the Association, but may be restored to full membership upon payment of the dues for the current year. During the period of suspension persons shall forfeit all rights and privileges of membership in the Association.

Article II. Legislative Council

Section 1.—The Legislative Council shall consist of the Governing Board,

three members at large, one representative from each section and affiliated organization as hereinafter provided, and one representative from each state or province association having twenty-five active, professional, and sustaining members in the National Association; two representatives from each state and province association having one hundred active, professional, and sustaining members in the National Association; three representatives from each state or province association having two hundred and fifty active, professional, and sustaining members in the National Association; and four representatives from each state or province association having five hundred or more active, professional, and sustaining members in the National Association, as provided in section 2 of this article. State and province associations with less than twenty-five active, professional, and sustaining members may petition the Secretary for representation on the Legislative Council. The representatives (men or women) shall have equal rights. Each representative shall have one vote.

Section 2.—Members of the Legislative Council, except the Governing Board and representatives from sections and affiliated organizations, shall be elected by their state or province associations according to state or province constitution and as provided in Article V, Sections 5 and 6 of these by-laws. Such members shall hold office until their successors are elected.

Section 3.—It shall be the duty of the Legislative Council to pass on all legislation necessary for the conduct of the Association. Legislation may be initiated within the Council, the Governing Board, or by other members of the Association, providing in the latter case that fifty members in good standing petition the Legislative Council in writing at a regular meeting.

Section 4.—The Secretary shall keep a record of the proceedings of the Legislative Council and shall make a report at each meeting and at the National Convention. He shall notify each state or province association at least thirty days before its annual meeting of the number of persons in that state who are members of the National Association. This information is to be used by the state or province for determining the number of representatives to the Legislative Council as provided in Section 1 of this Article and in Article VI, Sections 5 and 6.

Section 5.—An annual meeting of the Legislative Council shall be held at the time and place of the National Convention. Special meetings may be called by the President or by the written request of a majority of the Legislative Council. The Secretary shall notify all members of the Legislative Council at least thirty days prior to the proposed meeting.

Section 6.—Thirty or more of the members of the Legislative Council, present in person or by proxy, shall constitute a quorum for the transaction of business as provided in Section 3 of this article.

Section 7.—Members of the Legislative Council may vote by proxy providing the proxy is a member of the National Association. A proxy may cast votes equivalent to the number of representatives in his state or province who so authorize him in writing. Such authorization shall be presented to the Secretary before the meeting convenes.

This written proxy is not transferable; must name the specific person who is authorized to cast the vote; and must be signed by the member for

whom the proxy is designated. Each member will designate his own proxy. If a given proxy is issued to more than one person, it thereby becomes automatically cancelled.

Article III. Governing Board

Section 1.—The Governing Board shall consist of the President, President-Elect, one Vice-President, the immediate Past President, and the President of each of the several districts. It will also include as non-voting members, the Secretary-Treasurer, and the Chairman of Field Service. The Governing Board members may be represented by proxy as provided in Article II, Section 7.

Section 2.—It shall be the duty of the Governing Board to suggest legislation through the Legislative Council or to put into effect the rules and regulations passed by that body and to take action in emergency situations that may arise between convention dates.

Section 3.—The Executive Committee shall consist of the President, the Immediate Past President, the President-Elect, the Vice-President, and the Secretary-Treasurer.

Section 4.—It shall be the duty of the Executive Committee to carry out the instructions of the Governing Board, and to take official action between meetings of the board.

Article IV. Officers

Section 1.—The officers shall consist of a President, President-elect, Immediate Past-President, Vice-President, and Secretary.

Section 2.—The President-elect and the Vice-President shall be elected annually by the Legislative Council at the time of the regular meeting, and they each shall not serve two consecutive terms in the same office.

Section 3.—The President shall act as chairman of the Legislative Council, Governing Board, Executive Committee, and convention committee of the National Convention as hereinbefore and hereinafter provided. He shall appoint all committees with the exception of such standing committees as are authorized by the Legislative Council.

Section 4.—The Vice-President shall act for the President in his absence.

Section 5.—The Secretary shall be appointed by and shall hold office subject to the vote of the Legislative Council which shall determine the remuneration of this office. It shall be his duty to keep all records, collect and disburse all finances, manage and edit all publications connected with the National Association, and perform such other duties as the Legislative Council may direct.

Section 6.—The President shall appoint annually a Certified Public Accountant who shall audit the books and accounts of the Secretary. The report of said Accountant shall be presented to the Legislative Council at the time of its regular annual meeting.

Article V. Nominating Procedure

Section 1.—There shall be a Nominating Committee, consisting of a chairman, to be appointed by the President of the American Physical Edu-

cation Association, and one representative from each district of the National Association, appointed by the President of that district. These appointments shall be made not later than October 15th. The Chairman of the Nominating Committee shall have the names of this committee published in the December issue of the *Journal of Health and Physical Education* with the suggestion that the membership at large may send in suggestions for nominations to the Chairman of the Nominating Committee.

The Chairman of the Nominating Committee shall write to each member of the Legislative Council on or before December 15th, giving a list of the committee members and inviting suggestions for nominations to be sent to the Chairman of the Nominating Committee or to the district representatives on the Nominating Committee.

The Nominating Committee shall meet prior to the Council meeting where officers are to be elected, at which time due consideration shall be given to all persons suggested for nomination.

If any member of the Nominating Committee cannot attend the annual meeting, the President shall appoint a substitute to attend, so that there will be full representation from all districts.

No restriction shall be placed on the Nominating Committee as to whom the nominees shall be. The committee shall first submit a slate of at least three names for the office of President-elect. A clear majority of the vote shall be indicated for one person, otherwise the two persons with the highest number of votes shall be again voted upon. Following the election of the President-elect, the Nominating Committee shall bring in a slate for Vice-President, when the same procedure shall be followed. Following the election of the Vice-President, the Nominating Committee shall bring in a slate of nine names for the three Members-at-large of the Legislative Council. The three individuals receiving the three highest numbers of votes shall be declared elected.

Article VI. District, State, and Province Associations

Section 1.—There shall be the following Districts: Eastern, Southern, Mid-West, Central, Northwest, and Southwest. It shall be the duty of the Legislative Council to assign the different states to their respective districts.

Section 2.—The provinces of Canada shall be considered upon the same basis as states as hereinafter provided.

Section 3.—Each district is entitled to one page in each issue of the official journal for news items and announcements pertaining to that district.

Section 4.—Each district, state, and province may form its own association, make its own constitution, elect its own officers, and manage its own affairs provided the National Constitution and By-Laws be not violated.

Section 5.—To be eligible for affiliation with the National Association, each district, state, or province association must hold at least one meeting each year, reporting same to the Secretary of the National Association within thirty days after date of meeting. Each state or province association must have at least twenty-five members of the National Association to be affiliated with that body, as hereinafter provided.

Section 6.—To become affiliated with the National Association a state

or province association shall petition the Legislative Council through the Secretary at least thirty days prior to the annual meeting of the Council. The petition shall include a copy of the state or province constitution, a list of the officers of the association, a copy of the minutes of the last regular meeting, a list of its members who are members of the National Association, and the names of the representative or representatives proposed for the Legislative Council.

Section 7.—The Legislative Council may accept or expel any district, state, or province association by two-thirds majority mail vote of the entire membership of the Council. No vote shall be valid beyond thirty days after date of official notification. A district, state, or province association may be expelled for violation of the Constitution and By-Laws of the American Physical Education Association.

Article VII. Organizations and Sections

Section 1.—The term "organization" refers to the type of official service rendered by that body. The term "section" refers to major interests of persons who constitute that group.

Section 2.—The following Affiliated Organizations are included in the National Association, to-wit:

Administrative Directors' Society, American Academy of Physical Education, College Physical Education Association, National Association of Directors of Physical Education for Women in Colleges and Universities, National Association of Employed Officers of the Y.W.C.A., National Collegiate Athletic Association, Society of State Directors of Health and Physical Education, Women's Division of the N.A.A.F., Y.M.C.A. Physical Directors' Society of North America.

Section 3.—The following Sections are included in the National Association, to-wit:

Public Schools, Recreation, Research, Teacher Training, Therapeutic, Women's Athletics, Men's Athletics, Dancing, Health Education, Camping.

Section 4.—Each organization or section shall have the right to fix the qualifications of its members.

Section 5.—To be eligible for affiliation with the National Association, each organization may and each section must, present or sponsor a program in connection with the National Convention, reporting same to the Secretary of the National Association within thirty days after date of meeting. Members of the National Association shall be permitted to attend the programs and discussions of any section. The section shall hold an annual meeting for the purpose of electing officers and conducting such other business as it may deem necessary.

Section 6.—To become affiliated with the National Association an organization or section shall petition the Legislative Council through the Secretary at least thirty days prior to the annual meeting of the Council. The petition shall include the title, purpose, and officers of the organization or section, a copy of the minutes of its last regular meeting, a list of its members who are members of the National Association, and the name of the

representative proposed for the Legislative Council as provided in Section 8 of this article. The Secretary shall send a copy of the petition to each member of the Legislative Council at least ten days before the date of said meeting.

Section 7.—The Legislative Council may accept or expel any organization or section at a regularly authorized meeting by a two-thirds vote of the members present. An organization or section may be expelled for violation of the Constitution and By-Laws of the American Physical Education Association.

Section 8.—Each organization or section shall elect one representative to the Legislative Council at the time of its regular annual meeting, providing it has twenty-five members in the National Association. The representative must be a member of the National Association.

Article VIII. Conventions

Section 1.—A National Convention shall be held annually.

Section 2.—The National Convention, except for the selection of the convention city, shall be conducted by a convention committee composed of the Executive Committee of the National Association, the Executive Committee of the district, and one member of the National Association from the convention city, that person to be selected by the Executive Committee of the National Association. The President of the National Association shall serve as chairman of the convention committee.

Section 3.—The convention city shall be selected at least two years in advance by vote of the Legislative Council, on recommendation of the Executive Committee, and endorsed by the Executive Committee of the District in which the meeting is to be held. This list must be accompanied by a written invitation from each of the cities proposed. The convention city shall be assigned to each of the several districts from time to time as financial and other conditions warrant.

Section 4.—A District Convention shall be considered as a part of the National Convention when the National Association convenes in a city located within the boundaries of that district.

Section 5.—The National Association and the district association shall share equally in whatever net receipts or deficits are acquired by the National Convention providing Section 2 of this article be not violated.

Article IX. Publications

Section 1.—The official magazine shall be called the *Journal of Health and Physical Education.* It shall be published by the National Association monthly, except in July and August, and be sent without charge to all members and patrons.

Section 2.—The National Association shall publish a Research Quarterly in March, May, October, and December of each year and such other materials as may be authorized by the Legislative Council. The Research Quarterly and other materials provided for in this Section shall be sent to professional, sustaining, and honorary members, and patrons without charge.

Article X. Honor Awards

Section 1.—The National Association may honor individuals for meritorious service in the profession of physical education or in allied fields of science and education by electing such persons as "Fellow of the American Physical Education Association" or to receive such other awards as may be approved by the Legislative Council.

Article XI. Investment of Surplus Funds

Section 1.—The Legislative Council shall decide at its regular annual meeting the amount of money required to conduct the business of the Association for the following year.

Section 2.—The Governing Board shall invest such sums as the Legislative Council may direct as part of a Permanent Fund.

Article XII. Amendments

Section 1.—These By-Laws may be changed only by a mail vote of the Legislative Council. A two-thirds vote of membership shall be necessary for a change. No vote shall be valid beyond thirty days after official notification.

Precedents and Traditions of the American Physical Education Association

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INTRODUCTION

RECOGNIZING that while the Constitution and By-Laws give us the foundations for our main procedures, there are constantly many details and minor actions to be considered if our organization is to function effectively and according to the wishes of the majority, President Strong Hinman appointed a committee in the fall of 1934 to compile a list of precedents and traditions for guidance. The committee made a study of the precedents that were already a record of official action, of those that were in use informally but not authenticated by official approval, and of such as might well be inaugurated for the sake of more effective functioning of our association affairs.

The committee was composed of one representative from each District Society of A.P.E.A. as follows:

Eastern District: Grover W. Mueller, Supervisor of Physical Education, Public Schools, Philadelphia.

Southern District: Mary C. Coleman, Director of Physical Education, Woman's College, University of North Carolina, Greensboro.

Mid-West District: Dr. Margaret Bell, Director of Physical Education for Women, University of Michigan.

Northwest District: Paul Washke, Director of Physical Education for Men, University of Oregon.

Southwest District: Winifred Van Hagen, Assistant State Director of Physical Education of California.

Central District: Mabel Lee, *Chairman*, Director of Physical Education for Women, University of Nebraska.

Much lengthy correspondence was carried on between the chairman and the members of the committee for over four months. Votes of all members were procured on each of three drafts of material, each covering over one hundred items. All members freely discussed all items. The discussions were compiled and sent back to the committee following the returns from each draft of the material. It was a laborious task but apparently, from the interest evinced, an agreeable one. This was not the work of a committee that permitted its names to be used by a chairman who did the work. It was the work of a committee that was wholeheartedly on the job. Every recommendation offered was a recommendation of the committee as a whole after an actual vote on each item.

As a result of this committee's study and recommendations, a few former actions of the Council were rescinded, many precedents already in practice were given official sanction, and a few new precedents were adopted for immediate inauguration. All precedents recognized to date are compiled into an official list for ready reference of all officers and other workers in Association affairs. In the hopes that they will facilitate effective action and lead to a clear interpretation of the wishes of

the Council, all workers are urged to become familiar with these Precedents, especially those related to their office or line of work.

These precedents have been adopted by the Legislative Council unless otherwise stated. Cross references are listed at the end.

AFFILIATED ORGANIZATIONS

1. Organizations affiliated with A.P.E.A. are requested not to hold meetings at such places and dates as will interfere with attendance at A.P.E.A meetings.—*Adopted April 24, 1935.*

AFFILIATIONS

2. A.P.E.A. affiliated with the World Federation of Education Associations. —*April 26, 1933.*

3. A.P.E.A. joined the Citizens League for Constructive Economy.—*April 26, 1933.*

4. The Association voted to seek affiliation with important educational organizations.—*April 24, 1935.*

COMMITTEES

Consolidation

5. A Committee on Consolidation was appointed.—*Year 1934–35 by the President.*

Constitution

6. A standing Committee on Constitution was established.—*April 20, 1932.*

Convention Set-Up

7. A Committee on Convention Set-Up was established.—*Year 1934–35 by the President.*

Exhibits

8. A standing Committee on Convention Exhibits was established consisting of four members, three of whom shall be appointed by the President, one of the original three appointed to serve for one year, one for two years, and one for three years, each appointee thereafter to serve three years, with one new member being appointed annually and with the senior member serving as chairman. The fourth member shall be appointed each year by the Convention Manager and President. He shall represent the Convention City and shall serve as Local Exhibit Chairman. This committee shall be organized to permit power to the Chairman and Local Chairman for quick administrative action.—*Adopted April 24, 1935.*

Expenses of Members at Special Meetings

9. Expenses for attendance at a special call of a committee may be paid by A.P.E.A. to the members, wholly or in part, upon decision of the Executive Committee, provided the Chairman of the committee can prove to the Executive Committee the urgency to A.P.E.A. interests of such a called meeting.—*Adopted April 24, 1935.*

Historical Exhibits

10. A Committee on Historical Exhibits was appointed.—*Year 1934–35 by the President.*

Honor Awards

11. A standing committee on Honor Awards was established.—*Feb. 1929 by the President and Dec. 1929 by the Council.*

12. The Honor Awards Standards shall be as follows:

I. A candidate for the Fellowship Award must qualify in Age, Preparation, Experience and Character.

A. Age—At least 35 years of age.

B. Preparation—At least a Master's degree or its equivalent in study.

C. Experience—At least 10 years of experience as a teacher, supervisor, director, or combination of same in the field of Health Education or Physical Education.

D. Character—A person of fine moral character.

II. Having qualified as a candidate, according to Number I, the person being considered will then be judged according to Number III and must have met at least five of the conditions that are listed below under Leadership, Service, and Contributions.

III. Leadership—Service—Contributions:

A. Office holder in the National Association.

B. President of a District in the National Association.

C. President of Department of School Health and Physical Education in the National Education Association.

D. Chairman of an American Physical Education Association Committee (not Booklet Committee).

E. President of Women's Division, N.A.A.F. or Chairman of the Executive Committee.

F. President of the College Physical Education Association.

G. President of National Association of the Directors of Physical Education for College Women.

H. Outstanding leadership in some special field connected with Physical Education or Health Education, not included in the above.

I. Committee work over a period of three or more years with local, district, or national organizations.

J. Twenty or more addresses before educational groups, conventions, assemblies, luncheon meetings, radio presentations and such other meetings that are held in the interest and promotion of Health Education or Physical Education.

K. Contributing articles for handbooks, newspapers, magazines not covered in *N* (see below).

L. Carrying on research problems as they help to promote the profession.

M. Author or co-author of one of more books in Health Education or Physical Education.

N. Author of five or more articles which have been accepted and published by magazines of national scope—or brought out in monograph form.

O. President of a State Physical Education Society.

—*Adopted April 26, 1933.*

13. A three-fourths vote of the committee shall be necessary for the approval of a candidate.

Candidates shall be proposed by committee members who know them.

No more than eight fellowships shall be awarded in any one year.

All candidates shall be proposed not later than January 1 of the calendar year.

Successful candidates shall be advised that they may receive their awards at either the district or national conventions.

Unsuccessful candidates may be recommended in ensuing years but without any prior claim for special consideration.

Candidates should not be advised that they are being considered for the award.—*Adopted April 24, 1935.*

Luther Gulick Award

14. A Committee on the Luther Gulick Award was appointed.—*Year 1934–35 by the President.*

Necrology

15. A standing Committee on Necrology was established.—*April 20, 1932.*

16. The Reports of the Necrology Committee shall be given at a larger meeting of Convention than a Council meeting and according to a plan that will surround them with proper dignity.—*Adopted April 26, 1933.*

Nominating

17. There shall be a Nominating Committee appointed each year by October 15 consisting of a chairman appointed by the President of A.P.E.A. and one member from each District appointed by each District President. —*Adopted April 26, 1933 and placed in Constitution April 24, 1935.*

18. The Chairman of the Nominating Committee shall have the names of the members of the committee published in the December issue of the *Journal,* calling for nominations from all members of the A.P.E.A. Also by December 15 the chairman shall send to all members of the council the same announcements.—*Adopted April 26, 1933, and placed in Constitution April 24, 1935.*

19. The Nominating Committee shall meet prior to the Council meeting when the election is to be held and it shall give due consideration to all persons suggested as candidates. A slate of three names shall be presented for each office with opportunity for additional nominations from the floor.—*Adopted April 26, 1933 and placed in Constitution April 24, 1935.*

20. The President shall appoint a substitute on the Nominating Committee to represent a district whose member is absent from the meeting. —*Adopted April 21, 1934 and placed in Constitution April 24, 1935.*

21. No restrictions are to be placed upon the Nominating Committee as to who the nominees shall be. The Committee shall first submit to the Council the nominees for the presidency and that election shall be held before the nominees for other offices are named. A clear majority of votes shall be necessary for election; if not won on the first ballot a second ballot shall be taken on the two nominees having the highest number of votes. After the president is elected, the committee shall retire to decide upon the nominees for the remaining offices, following the same election procedure.—*Adopted April 21, 1934 and placed in Constitution April 24, 1935.*

22. The Committee shall submit nine names of candidates for members-at-large on the Governing Board and the three receiving the highest number of votes shall be elected.—*Adopted April 24, 1935.*

23. The Committee should feel free to consider members of their Committee when nominating members for various offices.—*Adopted April 24, 1935 by Executive Committee.*

New Sections

24. A Committee on New Sections was appointed.—*Year 1934–35 by the President.*

Precedents for Guidance

25. A Committee on Precedents was created, with one person from each District appointed on its membership.—*Year 1934–1935 by the President.*

Publicity Committee

26. A Publicity Committee was created.—*Year 1932–1933 by the President.*

27. An editing committee of three was established, the Secretary-Editor to be one of the three, to look over the various reports on the subject of publicity and to draw up an outline to be published by the Association.—*April 24, 1935.*

Representation on Committees

28. No committee of A.P.E.A. shall have representation from any organization not affiliated with A.P.E.A. except by permission of the Legislative Council.—*Adopted April 18, 1934.*

Resolutions

29. A standing Committee on Resolutions was established.—*April 20, 1932.*

30. The Resolutions Committee was instructed to prepare resolutions regarding affairs of national interest which are pertinent to the Association, these to be passed upon by the Executive Committee.—*Adopted April 23, 1935 by Executive Committee.*

Women's Athletic Editorial Committee

31. A Women's Athletic Editorial Committee was established.—*December 30, 1930 by Executive Committee and April 14, 1931 by Council.*

CONVENTIONS

Advertising

32. Advertising should not be used in the convention program except in rare cases and then only upon approval of the Program Committee which shall determine its placement in the program.—*Adopted April 24, 1935.*

Agreement with Hotel Management

33. No agreements shall be entered into with hotel managements or any commercial group in reference to convention affairs before the Convention Manager and all officers who determine such agreements shall have become

familiar with the details of the latest copy of the official Convention Set-Up, which shall be sent to them by the Secretary before the consideration of agreements shall arise.—*Adopted April 24, 1935.*

Chairman of Convention Committees

34. A copy of the list of duties of the Chairman of each Convention Committee as recorded in the Convention Set-Up shall be sent to each chairman by the Secretary of A.P.E.A. immediately upon notification of his appointment. Before entering upon any work of his committee, the Chairman should be familiar with all details of his committee's assignment as listed in the official Convention Set-Up.—*Adopted April 24, 1935.*

Complimentary Rooms to Officers

35. The management of the convention headquarters hotel should be expected to furnish, during the convention, complimentary rooms as follows:

Suite of parlor and twin-bedroom for President and assistant.

Twin-bedroom for Secretary and assistant.

Twin-bedroom for Convention Manager and assistant.

Twin-bedroom for President of Host District.

Single bedroom for Field Secretary in those cases where the convention committee does not feel it inadvisable to ask for a room for a fifth person.

Office room for local committee.

Rooms as needed for all program gatherings.—*Adopted April 24, 1935.*

Convention Manager Elect

36. The Manager of the Convention to be held two years hence shall be appointed by the Executive Committee before the next convention following the selection of the city so that as Convention Manager-Elect he may observe the preparations for the current convention and may attend it recognized as the incoming Convention Manager.—*Adopted April 24, 1935.*

Convention Manager's Privilege

37. The Convention Manager may have the privilege of presenting badges to those local persons, not members of our profession, whom he wishes to honor, thus admitting them as guests to the meetings of the Convention. —*Adopted April 24, 1935.*

Convention Manager's Report

38. The Convention Manager shall present to the Secretary within one month after the close of the convention a minutely detailed financial report of the convention. The Secretary shall at once send copies of this full report to all members of the Executive Committee, who shall study it and, in light of it, shall make recommendations concerning the next convention to the Secretary; the Secretary shall compile these recommendations and shall, no later than September 15, send this compilation with a copy of the Convention Manager's full report to the incoming Convention Manager. Also the President and Secretary shall condense this report and the Secretary shall send copies of the condensed report to all members of the Council by September 15 following the Convention reported.—*Adopted April 24, 1935.*

Convention Set-Up

39. A Convention Set-Up outlined in minute details shall be adopted and used as the official guide for all convention committees.—*Adopted April 24, 1935.*

40. Copies of the Convention Set-Up shall be sent to each member of the Program Committee by the Secretary before the opening of the new school year.—*Adopted April 24, 1935.*

Demonstrations

41. For convention programs the type of demonstration that presents the actual physical education program in daily use both as to activity and costumes shall be given preference over the type that presents a display of activities and costumes prepared especially for the occasion. (This shall not be interpreted to mean exhibitions are not to be permitted but they should not displace demonstrations of regular work.)—*Adopted April 24, 1935.*

Exhibits

42. Areas to be used for exhibits during the convention should be secured from the hotel without expense to the Association if such arrangements can be made. The Association thereupon shall rent space to commercial exhibitors according to the Exhibit Contract drawn up by the Committee on Exhibits and approved by the Convention Program Committee. There shall be no charge for educational exhibits.—*Adopted April 24, 1935.*

43. A contract shall be made with the convention headquarters hotel management to the effect that no exhibit space or rooms shall be rented by the hotel to persons for exhibits which have for their primary aim appeal to our convention delegates and visitors, except when those persons have at the same time rented exhibit space of A.P.E.A.—*Adopted April 24, 1935.*

44. Exhibits pertaining to ultra violet and mechanical exercising appliances and other therapeutic devices shall be accepted only upon the approval of the officers of the Therapeutics Section, unless none of the officers of that section is a licensed medical practitioner, in which case an additional person so licensed must also give approval.—*Adopted April 24, 1935.*

Fees

45. Convention fee shall be as follows:

Members of our profession who are not members of A.P.E.A.	$2.00
Members of A.P.E.A.	1.00
Students who are not members of A.P.E.A.	.50
Student members of A.P.E.A.	.25
(upon registration and procurement of badge)	
Students who attend only the Saturday meetings	Free
(upon registration and procurement of badge)	
Persons not members of our profession	1.00

—*Adopted April 24, 1935.*

46. The reduced convention fee granted to members of A.P.E.A. shall be granted to departmental and library memberships through one representative for each membership.—*Adopted April 24, 1935.*

Formal and Informal Occasions

47. Convention programs should not designate the reception, banquet, or other meetings to be either formal or informal. (The statement of the hour and the type of the occasion should be sufficient to define each.)—*Adopted April 24, 1935.*

Host District's Program

48. As a rule, an entire day of a convention should not be set aside for the host District Society.—*Adopted April 24, 1935.*

Members of Main Committees

49. All members of the Program Committee and main Convention Committee should be familiar with all details of the complete Convention Set-Up before undertaking any duties in preparation for the convention.—*Adopted April 24, 1935.*

Meetings of Affiliated Organizations

50. Opportunity shall be given for breakfast or luncheon meetings for those affiliated organizations which wish to meet during A.P.E.A. conventions. —*Adopted April 24, 1935.*

Payment to Speakers

51. Honoraria shall not be paid to speakers at Conventions; expenses may be paid, but only to those speakers who speak at general sessions, and who are not members of our profession.—*Adopted April 21, 1934.*

The above rule was modified to the effect that this rule is not to prevent the payment of honoraria or expenses from funds not under the control of A.P.E.A., which payment may be made, however, only with the consent of the Program Committee.—*Adopted April 24, 1935.*

52. Speakers on sectional programs who are not members of our profession shall not be paid from Convention or A.P.E.A. Treasury except in rare cases taken under advisement by the Executive Committee upon application for a decision by the Program Committee, in which case expenses only may be considered. This rule is not to prevent the payment of expenses or honoraria from funds not under the control of A.P.E.A. But this may be done only upon consent of the Program Committee.—*Adopted April 24, 1935.*

53. Members of our profession who speak on A.P.E.A. convention programs should under no circumstances be paid honoraria. They should also not be paid even expenses except in rare cases to be decided by the Executive Committee on application by the Program Committee.—*Adopted April 24, 1935.*

54. As a principle of ethics, members of our profession who speak on District convention programs should under no circumstances accept honoraria. They should be paid expenses only, if invited to speak at a general session of a convention of a District in which they do not reside.—*Adopted April 24, 1935.*

Payment of Luncheon and Banquet Expenses

55. Members of our profession should pay for their own luncheon and banquet expenses even when they are on the program or are invited to sit at the head table.—*Adopted April 24, 1935.*

56. Persons not members of our profession who are invited to sit at the head table at a convention gathering should be the guests of the organization. —*Adopted April 24, 1935.*

ATTENDANCE AT CONVENTIONS OF PERSONS NOT MEMBERS OF THE PROFESSION

57. A person who is not a member of our profession may attend a convention upon registration and payment of a $1.00 fee or may attend any one session of a convention upon presentation of a single admission ticket which may be purchased at the registration table. The price of these tickets shall be set by the Program and Finance Committees, jointly.—*Adopted April 24, 1935.*

PROFESSIONAL ENTERTAINERS

58. The expenditure of money for professional entertainers at social functions of the convention should be discouraged.—*Adopted April 24, 1935.*

SELECTION OF CONVENTION CITY

59. The convention city shall be selected at the last Council meeting of convention and two years in advance.—*Adopted April, 1931 and made Constitutional ruling April 24, 1935.*

60. Tentative unofficial promises to hold conventions in the future at certain stated places shall not be made.—*Adopted April, 1931.*

SPECIAL FEATURES OF PROGRAMS

61. No performances that interfere in any way with attendance at our own convention meetings should be sponsored or recognized by the Program Committee. If desirable features for the program, they should be scheduled at hours not conflicting with our own meetings.—*Adopted April 24, 1935.*

UNOFFICIAL MEMBERS OF CONVENTION COMMITTEES

62. The President-Elect of the District Society that is to be the host of the Convention to be held the year following the current convention and the President-Elect of A.P.E.A. and the Convention Manager-Elect, shall be placed on the correspondence list of the current Program and Convention Committees without voice, in recognition of the fact that they will be the important members of the next Program Committee.—*Adopted April 24, 1935.*

COUNCIL

FISCAL YEAR

63. The fiscal year was established as of January 1 through December 31. —*April 20, 1932.*

FOREIGN REPRESENTATION

64. Foreign representation on the Legislative Council shall not be approved. —*Adopted April 19, 1932.*

MEETINGS

65. The Council should meet in two sessions on Wednesday of Convention week in order that it may have sufficient time to attend to important business. —*Adopted April 24, 1935.*

66. A closing meeting of the Council should be held on Friday afternoon or on Saturday morning which meeting the newly elected members should be invited to attend as guests. At this session the Council shall elect officers, members-at-large on the Governing Board, select the convention city for two years hence, receive the reports of committees that were functioning during Convention and induct the new officers and Council members into office. —*Adopted April 24, 1935.*

State Quotas

67. Library and Departmental memberships shall be included in counting state quotas for Council membership.—*Adopted April 24, 1935.*

68. The quotas for each state, determining the number of representatives permitted on the Legislative Council, shall be determined as of June 1. —*Adopted April 24, 1935.*

Term of Office of Members

69. Newly elected members of the Council shall assume the duties of their office immediately after the close of the A.P.E.A. convention following their election, except in the case of those members elected by Districts at District Conventions following a national convention in any school year, in which case such members shall go on duty immediately after their election by their District. This shall apply to all members of the Council so that all new members elected or appointed any time during the year shall go on duty at the same time and so that the Council membership list shall remain constant throughout the year after its revision by the Secretary at the close of the annual convention.—*Adopted April 24, 1935.*

Voting Privilege

70. A member of the Governing Board may claim two votes in the Council provided he is a member of the Council as a representative of a state or a section as well as a member of the Governing Board.—*Adopted April 26, 1935.*

DISTRICTS

Division of Districts

71. The Middle West District was tentatively permitted to divide into two districts, a new Middle West and a Central District.—*April 26, 1933 and Recognized by Constitutional change, April 24, 1935.*

Eastern District

72. The Eastern District Society of A.P.E.A. made a gift of $200 to the Treasury of A.P.E.A.—*April 23, 1932.*

President's Term of Office in National Affairs

73. A District President shall assume his duties as a member of the Council, and the Governing Board, immediately after the close of the National Convention following the District Convention at which he was elected except in the case of a District Convention following a National Convention in any school year, when he goes on duty immediately after his election by the District.—*Adopted April, 1931 by Executive Committee and April 24, 1935 by the Council.*

President-Elect's Relation to National Affairs

74. The President-Elect of each District shall be invited to attend the meetings of the Council without voice or vote and under the same restrictions his name shall be placed on the Council mailing list.—*Adopted April 24, 1935.*

State Assignments

75. The petitions of Wyoming and Oklahoma to become members of the Central District were granted.—*April 26, 1935.*

GOVERNING BOARD

Meetings

76. The Governing Board should meet Tuesday evening of Convention week to transact business in order that the Council may meet in two sessions on Wednesday with sufficient time to attend to important business.—*Adopted April 24, 1935.*

MEMBERS

Life Membership

77. Life membership was adopted at a flat rate of $80.00.—*April 24-26, 1935.*

OFFICERS

Accession to Office

78. All newly elected officers shall assume the duties of their offices immediately at the close of the convention at which they are elected.—*Adopted April 24, 1935.*

Announcement of Election

79. The announcement of the newly elected officers shall be made at the closing session of the Convention.—*Adopted April 24, 1935.*

Expenses at Annual Meetings

80. The expenses of the President and Secretary incurred in attendance at the National Convention shall be paid by A.P.E.A.—*Adopted April 24, 1935.*

Expenses at District Conventions

81. A national officer may be sent by A.P.E.A. to a District Convention upon invitation from the District, the expenses to be paid wholly or in part from the national treasury as determined by the Executive Committee except that expenses are not to be paid to send a national officer to a convention in his own district. This is not to be interpreted to mean that if a national officer resides in a certain district, no other national officer may be sent by A.P.E.A. to that district's convention.—*Adopted April 24, 1935.*

Officers' Kits

82. Officers' kits shall be established to be composed as follows:

Latest copy of National constitution
Latest copy of Precedents for Guidance
Copy of minutes of Council meetings of past three years

Copy of minutes of Governing Board and Executive Committee meetings of past three years
Latest copy of Convention Set-Up
Copy of names of members of new Council
Copy of last financial report
Copy of convention financial reports of the last two conventions —*Adopted April 24, 1935.*

83. These kits shall be sent by the Secretary to all members of the Governing Board before the opening of the new school year.—*Adopted April 24, 1935.*

Past Officers

84. All past presidents of A.P.E.A. and the immediate past president of each District shall be invited to attend Council meetings with voice but without vote except the immediate past president of A.P.E.A. who has a vote by constitutional authority. Under the same restrictions their names shall be placed on the Council mailing list.—*Adopted April 24, 1935.*

PUBLICATIONS

Biographical Sketches of Honor Award Fellows

85. Biographical sketches of Honor Award Fellows shall be published together in some form.—*Adopted April 19, 1932.*

86. Photographs of the Honor Award Fellows shall be published in the special publication of their biographies.—*Adopted April 24, 1935.*

Journal

87. The cover of the *Journal* shall be the same year by year.—*Adopted April 19, 1932.*

88. The pages of the *Journal* shall be numbered consecutively for the respective years.—*Adopted April 24, 1935 by Executive Committee.*

Section Reports

89. The Section on The Dance was given permission to publish its report independently with the approval of the Executive Committee, providing it would not incur any financial obligation for the A.P.E.A.—*April 20, 1932.*

REPRESENTATION OF A.P.E.A.

90. So that A.P.E.A. may take its place among all other leading groups of the nation that are represented at important gatherings, it shall seek opportunities to be represented at conventions of other organizations and at special occasions by certain ones of its members who will attend as the official representatives of A.P.E.A. without expense to the Association. These representatives shall be appointed by the President and be reported to the Council. —*Adopted April 24, 1935.*

SECRETARY-TREASURER-EDITOR

Copies of Constitution and By-Laws, Precedents, and Traditions

91. Each fall the Secretary shall send to all members of the Council the latest copy of the Constitution and By-Laws and of the Precedents.—*Adopted April 24, 1935.*

Material to Convention Manager

92. The Secretary shall, in May, send to the incoming Convention Manager the following:

Latest copy of Precedents and Traditions of A.P.E.A.
Latest copy of the Convention Set-Up
Lists of the members of the incoming Council and the incoming Executive Committee
Copy of the last Convention Report.—*Adopted April 24, 1935.*

Records of Honor Award Fellows

93. The Secretary shall collect for the Association files photographs of all Honor Awards Fellows.—*Adopted April 19, 1932 by Executive Committee and April 24, 1935 by the Council.*

Relation to Nominating Committee Ruling on Proxies

94. One month before Convention convenes the Secretary shall send to all Council members the ruling of the Executive Committee on proxies, interpreting the constitution on that point. Telephone and telegraph communications from Council members shall be accepted by the Secretary in naming proxies.—*Adopted April 24, 1935.*

Section Chairman Data

95. Before Convention convenes the Secretary shall send to each section chairman a list of the names of all persons who have held office in his section for the past ten years, giving a statement of the district affiliation and type of position held by each person at his time of service in the office.—*Adopted April 24, 1935.*

Voting Privilege

96. As a paid executive of the Association, the Secretary shall not have a vote.—*Adopted April 24, 1935 by Executive Committee.*

SECTIONS

Election of Officers of Sections

97. Prior to the first meeting of the section a nominating committee of three shall be appointed by the Section Chairman who shall supply the committee chairman with the list of officers of that section who have served for the past ten years. The committee shall present for each office, chairmanship and secretaryship, a slate of names of two or more persons who have consented to serve if elected. Nomination from the floor may be made but only of persons who have consented to serve if elected. The voting shall be by ballot and the Chairman should remind all that according to the By-Laws only members of A.P.E.A. may vote. The results of the election shall be announced immediately by the Chairman to the Secretary of the A.P.E.A. and to the newly elected officers.—*Adopted April 24, 1935.*

Gifts to A.P.E.A.

98. The Women's Athletic Section made a gift of $200 to the Treasury of the A.P.E.A.—*April 23, 1932.*

Length of Term of Office

99. No chairman of a section shall hold office longer than two consecutive years.—*Adopted April 24, 1935.*

Meetings Between Conventions

100. A section may hold meetings during the year if it does not violate the Constitution in so doing, or interfere with A.P.E.A. convention and if it does not duplicate meetings.—*Adopted April 23, 1935 by Executive Committee.*

Recognition of New Sections

101. A Health Education Section was recognized as an additional section of A.P.E.A.—*April 26, 1933.*

Refusal of Affiliation

102. A Section on Swimming was refused affiliation after opposition by members of the Women's Athletic Section which covers swimming for women. *April 23, 1932.*

Sections on Archery, Phi Delta Pi, Students, and Tests and Measurements were refused affiliation.—*April 23, 1935 by Executive Committee.*

Vacancies in Chairmanships

103. In case of vacancy in a section chairmanship occurring during the year, it shall be filled by appointment by the President.—*Adopted April 24, 1935.*

CROSS REFERENCES

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Rate of Growth as a Health Index

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THIS study reports a comparison of the health status of sixty children gaining less than two pounds in a year with that of sixty children having good growth records.

Educators and others concerned with the health of school children have long realized the need for some procedure whereby those children whose health is in greatest need of attention may be screened, routinely and with a minimum of effort, from the general school population. The index most generally used has been the child's relation to average weight. The "overweight" or "underweight" child was supposed not to be in good health, particularly so far as his nutrition was concerned. Evidence indicates that this assumption is not safe.

Clark and Sydenstricker[1]* report a study of 9,973 school children between 6 and 16 years of age in which weight alone was found to be not a sufficiently accurate measure to be used as an index of a child's nutrition. Chadwick and Zacks in a paper concerning the underweight clinics in Massachusetts[2] made the following statement: "That one-third of the pulmonary cases found were in children who were not underweight, and that twenty per cent of the hilum cases found in the contact group were normal or overweight children, is conclusive evidence that all children regardless of weight should be given a thorough examination for tuberculosis." In September, 1929, we published a study[3] which showed the statistical fallacy of using a crude measurement such as weight for age and height to determine the status of a child's nutrition. The same year, the American Child Health Association[4] published the following statements: "The use of height–weight–age tables ascribes to recent history of nourishment much that should be attributed directly to skeletal dimension. . . . Cases who are markedly underweight or overweight for their age and height are so merely by virtue of chest dimensions and hips and, therefore, this method of selection does not adequately serve as an

* Numbers refer to bibliography at end of article.

index of nutrition. . . . As far as we may agree that nutritional status, as we now use the term, shall refer to differences amongst children caused by hygienic influences such as food and sleep habits of immediately preceding years and not to genetic, prenatal, and early growth determinants, we must discard weight in any form as a diagnostic measure. This follows directly from the huge rôle played by skeletal differences in the determination of the variability of weight."

From a study made by Turner, Lytle, and Winnemore[5] it was concluded that "since school children are weighed regularly anyway as an educational procedure, and since children who have failed to grow over a three-months period show a much poorer condition in respect to habits, illness and physical defects, it seems worth while for the teacher, the school nurse, and the school physician to give such children individual attention."

The purpose of the present study was to determine whether poor annual gains could be used as an index in calling our attention to children with substandard health. It seemed worth while to study the health practices, the recent illness, and the physical defects of children who gained poorly and children who gained exceptionally well to see whether the two groups differed in these respects.

Upon examination of the complete weight records of 3,459 children scattered through the 15 elementary schools of Malden, Massachusetts, it was found that 60 of the children in Grades I–VI (approximately 2 per cent of the group) had gained less than 2 pounds between September, 1931, and September, 1932. We wished to compare these children (Group I) with a control group of similar children having excellent growth records (Group II). In order to make a random choice of children for the latter group, each child in Group I was matched as nearly as possible by selecting the first child of the same sex and approximate age from the list of children who had made from 100 per cent to 125 per cent of the average gain recorded in the Baldwin tables.[6]

It will be noted that Group I is composed of children who gained very poorly during a one-year period, while the children in Group II had all showed an optimum growth record.

Table I shows the age distribution for boys and for girls in Groups I and II.

Children in the control group appear to come from families of slightly superior economic status than those in Group I (Table II).

Twice as many skilled laborers as well as more families with a second wage earner occur in the former group. Unemployment of the father is twice as prevalent in Group I (eighteen cases) as in Group II (nine cases). However, unemployment of the father is compensated by some other wage earner in eight cases in Group I, so that the actual number of families in which there is no wage earner is the same for the two groups.

TABLE I

AGE DISTRIBUTION

Age in Years	Group I		Group II	
	Boys	Girls	Boys	Girls
6	–	3	1	3
7	9	2	7	3
8	4	6	2	6
9	2	7	2	8
10	7	4	8	4
11	2	4	3	4
12	3	2	3	2
13	1	2	1	1
14	1	1	1	1
	29	31	28	32

TABLE II

ECONOMIC STATUS

	Group I	Group II
No. of children	60	60
Family of 5 or more	41	49
More than one wage earner in family	3	8
No wage earner in family	10	10
Children doing outside work	5	8
Occupation of fathers:		
Business men	13	9
Skilled laborers	12	25
Unskilled laborers	9	13
Unemployed	18	9
Unknown	2	2
Occupation of mothers: (father dead)		
Housewife	1	2
Business women	2	0
State children	3	0

As a basis for comparison of the health status of children in these two groups, each child was given an examination by the school physician, assisted by the school nurse, to which parents were invited. In every case except four, parents gave permission for a complete examination with clothing removed to the waist. Tonsils, nose, skin, teeth, heart, and lungs were examined for defects. Following the plan of pediatricians in the American Child Health Association study,[4] the basis used for the diagnosis of seriously defective nutrition was the judgment of the physician using the following indices:

1. Miscellaneous
   - *a*) Color and appearance of mucous membrane
   - *b*) Color and appearance of skin
   - *c*) Luster of eyes
   - *d*) Winged scapulae
   - *e*) Dry and dead appearing hair

2. Muscle—amount and quality (deltoid, calf, back, and abdomen)
3. Subcutaneous tissue—(over deltoid, calf, ribs)
4. Weight, height, and posture.

All observable defects, including structurally poor posture as judged by the physician at the time of the physical examination, were recorded. Data in regard to eye conditions and ear conditions were collected from the school records.

At the same time, an individual health habit conference took place between the child and a health education teacher, for which a chart (Form I—see Appendix) for recording the child's behavior during the previous twenty-four hours was used as a basis. The children were told that we were trying to find out why some children grew better than others. They were asked to answer questions fully and accurately.

Experience has shown that children remember fairly well what they have done during the preceding twenty-four hours, and that data in regard to health behavior are more accurate if the questions asked concern this interval rather than what the child "usually does." The possibility of misstatements in an eagerness to show health knowledge was avoided by permitting the child to tell what he "usually did" *after* specific behavior for the preceding twenty-four hours had been reported.

Data concerning recent illness and earlier serious illness, scholastic grades, and absences from school were obtained from the physical record cards and from school life records, and by questioning parents and children. Information about the child's nervous condition and scholastic ability was obtained from the classroom teacher. We asked teachers to classify children as "nervous" only if nervousness was exhibited by extreme signs such as nervous twitching, lack of control of movements, and nervous inability to answer simple questions. In regard to scholastic standing, the child was to be reported as in the upper one-fifth of his class or below this standard.

Major physical defects, Table III, were found to be more than twice as prevalent among children having poor annual growth as among those with satisfactory growth records: fifty-one in Group I as compared with eighteen in Group II. Seriously defective teeth were recorded three times as often in Group I as in Group II. Eleven cases of defective nutrition were reported in Group I as compared with one in Group II. Cases of poor vision, poor posture, and nasal defects were found to be more numerous in Group I. Almost twice as many seriously defective tonsils occurred in Group I. Eleven cases, however, were reported in the control group. More children in Group II had had tonsils corrected.

In Table IV, combinations of major physical defects (starred in Table III) are recorded. Forty-four children (73 per cent) of the control group were found to be free of major physical defects as compared with twenty-

five children (42 per cent) of the poor growth group. Only one child in the control group was found to have more than one major physical defect, while eleven children in Group I possessed two or more such defects.

TABLE III

PHYSICAL DEFECTS

	Group I	Group II
*Tonsils; (3)	9	3
*Tonsils; (2)	8	8
Tonsils; (1)	3	7
Total	20	18
Tonsils corrected (not included in total)	26	31
*Teeth (3)	13	4
Teeth (2)	7	16
Teeth (1)	21	14
Total	41	34
*Sight	6	2
Eyes (not vision)	1	4
*Hearing	1	0
Ears (not hearing)	4	0
Enlarged Cervical Glands	1	2
*Heart	2	0
*Lungs	1	0
Nose	4	0
*Nutrition	11	1
Posture	6	4
Skin	6	1
Rachitic chest	6	7
Total (not including tonsils corrected)	110	73
Total major physical defects	51	18

*Major defects.

TABLE IV

COMBINATIONS OF PHYSICAL DEFECTS
(Starred in Table IV)

No. of physical defects	Group I	Group II
0	25	44
1	24	15
2	7	0
3	4	1

In connection with our habit study, we wished to make as detailed a comparison of the children's diets for the sample day as the available data would permit. We recognize that a child may have forgotten one or more items in his diet and that the size of servings was unknown. The standard

we adopted for comparison was, therefore, purposely set below the usually stated optimal daily requirements.

In order to determine how many children were having adequate protein, we found out how many children were drinking four, three, two, or one glasses of milk daily, and how many included some protein food other than milk in their diet. Children taking three or four glasses of milk daily were included in this group even though they had not taken an additional protein food. In our habit study, children not included in this classification appear as children having a "limited protein supply." Recognition of milk intake in other foods was made whenever possible. Drinks such as eggnog, ovaltine, and cocoa were credited as half glasses of milk unless no milk was used in their making. Milk taken on cereal, cream soups, ice cream, custards, and milk puddings was also recorded as half-glasses of milk.

The common sources of vitamins were checked by means of the Weston-Levine Vitamin Chart.* Each child was expected to have included one of the foods classed as "excellent" or "potent" or two of the "good" foods for each vitamin. (One "good" food was accepted for Vitamin G.) Children who did not meet this standard for each vitamin were recorded as having an "incomplete vitamin supply."

Under minerals the sources of calcium, phosphorus, and iron were checked. We did not set as a standard for comparison the desirable daily requirement of 1 gram of calcium, 1 gram of phosphorus, and 0.015 grams of iron. Instead we compared the number of children in the 2 groups having, during the day, approximately 0.7 grams of calcium, approximately 0.7 grams of phosphorus, and at least 4 of the major iron foods, supplying approximately 0.006 grams of iron.

Children who were not able to meet the three standards set for calcium, phosphorus, and iron were later classified in the habit comparison as children having a "limited mineral supply."

In our habit comparison, we listed the number of children who did not start the day with the type of breakfast advised by pediatricians and nutritionists: namely, (1) fruit, (2) milk or cocoa, and (3) a solid food such as cereal, bread, potato, egg, or meat. Such children are classified as having "inadequate breakfast."

In addition to the four major deficiencies of diet, namely, "limited protein supply," "incomplete vitamin supply," "limited mineral supply," and "inadequate breakfast," we compared fifteen other habits. We wished to know how many children included no fruit in their diet, how many had no vegetable other than potato, how many were taking tea or coffee, how many were taking less than four glasses of water during the day, and the number of children eating candy between meals. We were also interested

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in determining how many children were having inadequate sleep, how many slept with windows closed, how many shared their bed with another person and whether any children took rest periods during the day. Inadequate sleep was based on the following standard: eleven and one-half hours at ages six and seven; eleven hours at ages eight and nine; ten and one-half hours at ages ten and eleven; and ten hours at ages twelve, thirteen, and fourteen. Nervousness and scholastic rating reported by the teacher and characteristically poor bodily carriage reported by the health educator were also included. In addition, we tabulated data in respect to time and regularity of bowel movements, outdoor exercise, and the presence of certain undesirable habits such as nail-biting, thumb sucking, and enuresis.

The difference in health practices between the two groups may be determined by a study of Table V. It will be noted that a total of 348 faulty health habits were reported by Group I, as compared with 195 by Group II. The four previously mentioned major deficiencies of diet (items 1–4, Table V) were appreciably more numerous among children with poor growth records—133 in Group I as compared with 89 in Group II. For the 3 items "no fruit," "no vegetable other than potato," and "less than four glasses of water," more than twice as many deficiencies were found in Group I as in Group II.

TABLE V

COMPARISON OF FAULTY HEALTH HABITS
(24-hour period)

	No. of children	
	Group I	Group II
No. of children	60	60
†Limited protein supply	24	11
†Incomplete vitamin supply	20	11
†Limited mineral supply	44	31
†Inadequate breakfast	45	36
No fruit	28	10
No vegetable other than potato	22	11
†Less than 4 glasses of water	38	16
†Tea or coffee	10	11
†Candy between meals	17	15
†Inadequate sleep	19	20
Sleeping with windows closed	17	6
Sharing bed*	36	35
No rest periods during day*	58	58
No bowel movement	4	2
No regular time for daily bowel movement*	31	27
†No outdoor exercise	26	3
Poor bodily carriage	15	5
Nervousness (reported by teacher)	14	4
Undesirable habits (nail biting, thumb-sucking, enuresis)	5	3
Total	348	195

†Major faulty health habits.
*Not included in total.

The numbers of children having tea or coffee, candy between meals, and inadequate sleep were found to be almost equally distributed between the two groups. To find the last item so reported is surprising. In our earlier comparison of children of intermittent growth[5] with those of regular growth, 50 per cent more children reported inadequate sleep among the intermittent group than among those with regular growth records. Adequate sleep is, however, one of the most difficult items to check by means of a sampling for a single day.

Seventeen children in Group I reported sleeping with the windows closed as compared with six in Group II. Twenty-six children in Group I and three in Group II took no outdoor exercise. However, rainy weather was more prevalent during the conference periods with the children of the poor growth group.

Poor bodily carriage was three times as prevalent among the children with poor growth records. Classroom teachers reported three times as many nervous children in Group I as in Group II. These teachers also reported twice as many children scholastically in the upper one-fifth of their class in Group II as in Group I.

Combinations of major faulty health habits (starred in Table V) in individual children, were found to be more prevalent in Group I than in Group II (Table VI). Twenty-six children with poor growth records as compared with nine children with satisfactory growth records were found to have more than three faulty habits.

TABLE VI

COMBINATION OF FAULTY HABITS

No. of faulty habits	*Group I*	*Group II*
0	1	9
1	9	16
2	11	14
3	13	12
	34	51
4	14	7
5	4	1
6	5	0
7	2	1
8	1	0
	26	9
No. of children	60	60

Records of illness during 1931 and 1932 and during life were also investigated. Twenty-nine cases of communicable and respiratory diseases were reported during 1931 and 1932 among children of Group I as compared with eighteen cases among those in Group II. Similarly, noncommunicable diseases were more prevalent in Group I, nine as compared

with two. Twice as many children in Group I reported having frequent colds.

The data concerning illnesses during life were not as complete as those for 1931 and 1932 but they were equally complete for the two groups studied. Both communicable and non-communicable diseases were equally distributed between the two groups during life.

No significant information concerning the frequency and cause of absences from school was obtained.

Table VII shows the prevalence of combinations of (1) physical defects, (2) faulty health habits, and (3) illness during 1931 and 1932 among children of the two groups. Twenty children in Group I as compared with eight in Group II were found in this condition. Seven children in Group I showed three faulty habits combined with illness during the year, and the presence of either two or three physical defects. No children in Group II had that number of health deficiencies.

TABLE VII

HEALTH DEFICIENCIES
PHYSICAL DEFECTS—FAULTY HABITS—RECENT ILLNESS

	Group I	*Group II*
None observed	0	6
Physical defect only	1	1
Faulty habits only	4	22
Illness only	0	2
1 or 2 Faulty habits and Illness	6	8
1 or 2 Faulty habits and 1 physical defect	1	2
1 or 2 Faulty habits and 2 or 3 physical defects	2	0
3 or more Faulty habits and Illness	14	7
3 or more Faulty habits and 1 physical defect	5	4
3 or more Faulty habits and 2 or 3 physical defects	0	0
Illness and 1 physical defect	0	0
Illness and 2 or 3 physical defects	0	0
Faulty habits and Illness and physical defects	20	8
3 Faulty habits and Illness and 2 or 3 physical defects	7	0
No. of children	60	60

It is of interest to note that no children showing recent illness and physical defects were without faulty health habits. Twenty-two children in Group II reported the presence of faulty habits only, as compared with four in Group I. This does not mean that faulty health behavior is not a factor contributing to poor growth, but rather that more children in Group II were free of physical defects and illness and therefore fell into this classification. A previous comparison (Table V) has shown faulty health behavior to be more prevalent in Group I. Nine children in Group II, as compared with one child in Group I, were without faulty habits.

SUMMARY

A group of sixty children in grades one to six, having a growth of less than two pounds for a period of twelve months, was compared with another group of sixty children of the same age, sex, and general racial dis-

tribution who had made an ideal growth during the preceding year (their growth being 100 per cent to 125 per cent of the average gain for children of their height and age). A comparison was made with respect to the health habits, physical defects, and recent illnesses in the two groups. The control group was secured by selecting at random from the children with ideal growth a child of the same age and sex for each child in the first group.

There is no measurement of health status which is objective and quantitative. The criteria mentioned were used as an index of health. It must be remembered that the individual illnesses, defects, and poor habits which we compared must have varied in seriousness and that the natural vitality and hence the ability to maintain growth under physical handicap must have varied among the individual children.

These three factors (illnesses, defects, and poor habits) are conditions for which children should receive special attention. They represent an index of health which may fairly be used in deciding whether poor growth points toward a lowered physical status. The figures presented in this study show that children with the poorest annual growth are appreciably worse off in each of these three respects than the children with ideal growth.

It is evident that more children of small stature than of large stature will be selected by any screening process based upon low annual growth. The fact that there is considerable variation among the average annual gains tabulated by different workers for children of the same age groups indicates natural variability and the need for further studies of distributions of annual gains. It would also be useful to secure information concerning the health and growth records of children during an annual period following a year of poor growth.

CONCLUSIONS

Good growth is one indication of health. The school children with the poorest annual growth are, as a group, distinctly inferior in respect to health behavior, the amount of illness, and the number of physical defects when compared with the children who have made the best growth. Further experience may indicate that it is worth while to give special attention each September to those children who have made the poorest annual growth during the preceding year. The gain in weight below which pupils should receive special attention should be determined upon the basis of further experience and upon the basis of the percentage of children which one desires to select.*

* A check in our own school population using three pounds for Grades II and III, and four pounds for Grades IV, V, and VI as dividing lines gave the following percentages of "poor gainers" in the respective grades: Grade II, 28%; Grade III, 23%; Grade IV, 47%; Grade V, 37%; Grade VI, 24%. These limits obviously select too large a group for special consideration. If the same number of children are to be selected from each grade, a different standard must be used for each grade level, or for each age level.

In determining the value of any such screening process, we should probably consider whether it is wiser to spend time in selecting and giving special attention to a particular group of children, or to spend the same time in positive health promotion with all children.

APPENDIX

Form I

Individual Health Conference

1. Name
2. Grade..... School..... Teacher.....
3. Age
4. Last Height
5. Weights
6. Average Weight
7. Physical Record from Classroom Physical Record Card
   - A. Defects recorded by physician
   - B. Corrected.....Date.....
   - C. Uncorrected
8. Illness during 1931–1932
   - A. Nature
   - B. Time and duration
   - C. Absence from school
   - D. Medical care during illness
   - E. Frequency of absence (copied from life card 1931–1932)
9. Teacher's remarks—
   - A. Nervous condition
   - B. Interest and ability in work..... In upper one-fifth of class.....
10. Health Habits (Record of last 24 hours)
    - A. Intake and Elimination
      1. No. glasses of milk at home.....school.....
      2. Breakfast
      3. Lunch
      4. Dinner
      5. Candy When?
      6. Food between meals
      7. Amount of water
      8. Bowel movement.....Usual time of movement.....
    - B. Rest Habits
      1. Bed time
      2. Rising time
      3. Supper time
      4. Activity before bedtime
      5. Number sharing room
      6. Number sharing bed
      7. Windows open
      8. Rest periods during day
    - C. Outside Activities
      1. After school
      2. Outdoor play
      3. Outside lessons
      4. Outside work
      5. Saturday and Sunday recreation

11. Additional Remarks—
    - No. in family
    - Mother living
    - Father living
    - Father working
    - Any other members of family working
12. Posture
13. Nervous condition
14. Undesirable habits (nail-biting, thumb-sucking, enuresis)

BIBLIOGRAPHY

1. Clark, T., Sydenstricker, E., and Collins, Selwyn D. "Weight and Height as an Index of Nutrition." *U.S. Public Health Service, Public Health Reports*, XXXVIII: 2 (January 13, 1923), 39–58.
2. Chadwick, H., and Zacks, D. "Observations in the Underweight Clinics of Massachusetts." *Journal of the American Medical Association*, XXXCIX: 9 (August 27, 1927), 670–675.
3. Turner, C. E. "Precision and Reliability of Underweight Measurement." *American Journal of Public Health*, XIX: 9 (September, 1929), 969–979.
4. Franzen, R. *Physical Measures of Growth and Nutrition*. New York: American Child Health Association, 1929.
5. Turner, C. E., Lytle, E., and Winnemore, C. "Intermittency in Growth as an Index of Health Status," *American Journal of Public Health*, XXII: 5 (May, 1932), 455–464.
6. Baldwin, Bird T. "The Physical Growth of Children from Birth to Maturity." *University of Iowa Studies*. (June 1, 1921.)

Crepitus in Normal Shoulder Joints

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During the years 1932–34, the writer made a study of 234 women students of Stanford University, ranging in age from 17 to 40, to discover what sounds were produced in the shoulder joints during the movements of flexion, extension, abduction, and adduction of the upper extremity. A stethoscope with the ordinary bell attachments was used. Although it was not entirely possible to eliminate all sounds produced by friction of the bell in contact with the skin, surface sounds were minimized by restricting the range and speed of the movements executed. Practice with the stethoscope made it comparatively easy to distinguish the superficial from the deep sounds.

It was found that the sounds produced in and around the humeroscapular and sterno-clavicular articulations could be heard best by holding the stethoscope in contact with the skin posterior to the acromion process and slightly below it, and over the sterno-clavicular joint. In most cases the sounds which originated in one of these joints were transmitted and could be heard at the other. In order to minimize the superficial sounds due to friction between the stethoscope and the skin, the individuals were asked to raise the arms slowly, one at a time, first in flexion and then in abduction, to a level slightly above the horizontal. A more extensive range of movement had to be eliminated from the experiment because of the difficulty of keeping the stethoscope in firm contact with the skin.

The sounds which were distinguished may be described as popping, grinding and muffled rumbling. Sometimes they could be heard easily without the stethoscope. There were no cases in which the sounds seemed to be produced by the contact of bone upon bone since they were dull. They might have been due to the stretching of ligaments on the side of the joint opposite to the direction of the movement, and possibly to vibrations caused by sudden or unusual tension on the tendons of contracting muscles. The vibration of tendons may account for the popping sounds to be heard in a gymnasium class when such exercises as deep knee bending are performed.

The grinding and rumbling sounds were not audible without a stethoscope but could be heard distinctly with it. These sounds were not like the scraping of roughened bony surfaces in contact during movement. They were dull and might be assigned to a condition of dryness

of the joints if there were any scientific evidence to indicate that the diarthrodial joints ever under normal conditions lack synovial fluid. At the present time there is no support for this assumption and the sounds must be attributed to the soft tissues surrounding the joints or playing upon them (such as tendons of the motor muscles).

In view of the possibility that age, weight, and habits of using the arms might account for the differences found in individuals, these factors were recorded and percentages of incidence computed. These data are presented below.

Total number of cases studied 234
No sounds 44%
Faint sounds 28%
Marked sounds 28%

Relative loudness on the two sides in right-handed individuals (130 cases)
Sounds more pronounced on the right side 33%
Sounds more pronounced on the left side 29%
Sounds equal on both sides 38%

Incidence according to age

Under 20 yrs. (172 cases)		20 yrs. and over (62 cases)	
No sounds	47%	No sounds	39%
Faint sounds	33%	Faint sounds	17%
Marked sounds	20%	Marked sounds	44%

*Incidence in athletic * as compared with non-athletic individuals*

Athletic (108 cases)		Non-athletic (68 cases)	
No sounds	59%	No sounds	47%
Faint sounds	24%	Faint sounds	25%
Marked sounds	17%	Marked sounds	28%

Incidence according to weight

Normal weight† (101 cases)		Overweight (41 cases)		Underweight (63 cases)	
No sounds	40%	No sounds	40%	No sounds	44%
Faint sounds	32%	Faint sounds	28%	Faint sounds	26%
Marked sounds.	28%	Marked sounds.	32%	Marked sounds.	30%

* Every individual was asked whether she played tennis or swam a great deal, since both these activities require use of the arms to a marked degree.

† Wood-Baldwin tables were used, modified somewhat by the subjective judgment of the writer and the Medical Adviser of Women.

The percentage of the total number of individuals studied in whom shoulder joint crepitus was present exceeded those in whom no sounds were heard by 12 per cent. In right-handed individuals there seemed to be little difference between the incidence and character of the sounds heard on the right and left sides. Age seems to be a factor in crepitation of the joints since those under twenty years show an incidence of 53 per cent as compared with 61 per cent for persons twenty and over. Swimming habits and the playing of tennis are also factors bearing upon crepitus; athletic individuals show an incidence of 41 per cent while in the non-athletic it was 53 per cent. The condition of overweight, underweight, or normal weight appears to have no effect upon the phenomenon.

A similar investigation was carried out on twelve arthritic patients at Letterman Hospital, San Francisco, in order to compare pathological with normal joints. Eleven of these were males ranging in age from twenty-three to thirty-nine years; one was a woman forty-six years old. The men were soldiers or officers in the army, the woman was the wife of a soldier and, presumably, not employed otherwise than in her own home. With these arthritic patients it was necessary to take into account the fact that in all the more pronounced cases movements were extremely limited, due either to muscular tenseness resulting from pain or to partial ankylosis of the joints. The evidence that arthritis causes crepitation of the joints was conflicting in many cases. For example, one man twenty-three years of age reported severe pain in the ankles, wrists, and joints of the hands, but none in the shoulder joints. When tested with the stethoscope during simple movements loud grating and grinding sounds were heard in both shoulder regions as well as in the ankles and wrists. External rotation of the humeri produced especially loud sounds. An analogous inconsistency was encountered in a graduate student at Stanford University, a woman thirty-two years old. For several years she had been seriously handicapped in such activities as tennis because of arthritis of the right shoulder. There had never been any pain or discomfort connected with use of the left arm (in swimming for instance).* On application of the usual test to the two shoulder regions, grinding sounds of apparently equal intensity were produced on the two sides. Shall we assume in these cases, that crepitus is an individual characteristic frequently due to causes not yet understood? In general it should be stated, however, that the arthritic patients studied were in no instances entirely free from crepitus, but since there were so few of them no generalizations are justified in comparing them with the group of normal college women who formed the basis of this study.

The following conclusions regarding the phenomenon of crepitus may be drawn:

1. Crepitation produced during joint movement is not necessarily due to conditions in the joints. Undoubtedly most of the sounds are produced by tendon vibration, stretching of ligaments, etc.

2. Crepitation of the joints appears to increase with age, since the incidence was higher in the older age group.

3. Crepitus tends to be less pronounced in the joints of athletic individuals than in the non-athletic. The movements executed in the ordinary activities of life have no effect on the phenomenon since right-

* Since the writing of this article, she has reported that she has recently experienced some pain in the left arm and shoulder also. This might indicate that some pathological changes had occurred in both shoulder joints, the left showing symptoms of pain and discomfort later than the right.—AUTHOR.

handed individuals show crepitation as much on the right as on the left side.

4. It has not been shown that crepitus is necessarily a sign of pathological conditions of the joints.

This investigation was undertaken at the suggestion of Dr. Arthur Meyer of the Anatomy Department of the University, and I am indebted both to him and to Dr. C. H. Danforth for their suggestions and criticisms. I wish, also, to express my appreciation of the assistance given me by the physiotherapy staff of Letterman Hospital, The Presidio, San Francisco, in permitting me to examine their arthritic patients.

A System of Notation for Recording Dances*

By Gertrude Cross
Claremont, California

I. THE NEED FOR DANCE NOTATION

MODERN research is continually attacking the intangible, the abstract, even the invisible; prying around with inquisitive fingers until it gets some sort of hold; and working to the end that the abstract may become more concrete.

A dance, while having its more material aspects, is a very elusive thing. It cannot be touched with the hands. One may watch it, but stop it for a moment to retain an especially lovely bit, and the dance is gone. Nothing remains but the frozen cross section of that lovely bit, which is an entirely different matter. The instant a dance is finished, it has vanished completely.

The same is true of music, but much music has been spared the fate of ceasing to exist with its creator. This has been accomplished through the medium of notation, a device for fixing the elusive elements which make up the composition.

As in music, why not so in dancing? An appropriate notation, well worked out, would serve to preserve dances in the same manner as most of our music has been preserved for us. A few attempts have been made to develop a dance notation, but on the whole, this field has been practically untouched.

The argument has been advanced that the writing down of dances by means of a notation would reduce the art to a mechanical exercise. This does not seem to have been the case with music, the unfeeling manner in which some people perform being due to factors other than the use of notation. In addition, all of the really great music of the world would be lost to us, or could never have been written in the first place, if it had not been for notation.

No art can attain its fullest development while it is transitory, belonging to the present only. It is essential that there be some means of keeping its works for the future.

II. A BRIEF HISTORY OF CHOREGRAPHY

Ever since the sixteenth century, at least, men have felt such preservation of dances to be necessary. Accordingly, several attempts have

* Rewritten and condensed from a Master's thesis of the same title, Claremont Colleges, Claremont, California. 1934.

been made to work out "choregraphies," or definite systems of signs for denoting the steps and movements of a dance.

The first such attempt which is known to us was in the latter part of the sixteenth century, when Jehan Tabourot (known as Thoinot Arbeau) described a courtly dance of his time by a series of letters, each of which referred to a certain prescribed step; as in the following example:

"R b ss d r d r b ss ddd r d r b ss d r b c."[1]

Early in the eighteenth century an elaborate system of choregraphy was worked out by Raoul Feüillet, a Parisian dancing master. His system, which was in use for roughly half a century, is the only one which has proved to be a real success. It consisted of arbitrary signs which indicated the movement of the legs through the air and the movement of the dancer through the room. It was logically worked out, complete, and practical. We must remember, however, that it was designed for use with the dances of the society in which Feüillet lived, and was useful only as far as those dances were concerned.

By 1905 two other systems had been designed for use in ballet dancing. Arthur de St. León made the first of these, which was later amplified and elaborated by Friederich Zorn. Zorn's system consisted of diagrammatic drawings of the leg positions, and arbitrary signs, many of which were similar in appearance to those used in shorthand.

Of late years the problems of choregraphy have increased because of the fact that modern dances may draw upon all possible movements of the body. Rudolf von Laban, the great German teacher, has worked out a system of choregraphy suitable to such dancing, which consists of geometrical figures placed on and about a three-lined staff. Each figure conveys an astonishing amount of information, and the system, although having certain disadvantages, is quite complete. Another German, Jaap Kool, has made a choregraphy the symbols of which are a combination of musical signs and simple drawings of the dancer. About half a dozen lesser attempts are known to us.

This brief review may serve to show that the idea of a dance notation is nothing new, that one or two systems useful with particular types of dances have been created, but that on the whole very little has been done in this field. Dance notation is as yet only in an exploratory and experimental stage.

III. THE MAKING OF A NEW CHOREGRAPHY

A reading of Doris Humphrey's article, "Handwriting on the Wall," in the *Journal of Health and Physical Education* for November, 1933, was the initial stimulus which suggested to the writer that it might be possible to describe the movements of a dance in kinesiological terms.

[1] Thoinot Arbeau, *Orchesographie*, p. 26.

Any dance is made up of a series of movements of the human body, and all possible movements of the body are already known by such terms as flexion, extension, abduction, etc. As this is true of every type of dance, a choreography made on this basis should be universal in its application.

The classification of movements under these particular terms was later found to be less satisfactory than had been anticipated, and other terms were used instead. The idea of building a new choreography persisted, however, and one was finally evolved.

It was realized at the outset that any dance may be more or less completely analyzed into its component elements. These component elements include such matters as the direction in which steps are taken, the rhythm and tempo of the steps, the direction faced by the dancer, the part of the body which is moving, the direction in which it moves, and many other matters.

In constructing the choreography, then, the procedure was to analyze the dance into these elements, and to devise appropriate symbols by means of which each element might be reproduced. An attempt was made to build the system in such a way that any possible movements might be indicated, in order that the notation might be applicable to many different types of dancing.

Many symbolic devices were tried and discarded. Certain others were retained as being suitable, and the system was gradually assembled. In many ways it is not yet satisfactory, and may be considered to be in a tentatively complete form only.

Because of the fact that in a small college it is difficult to find many people who are both interested in dancing and possessed of sufficient leisure to learn an unfamiliar system of notation, extensive testing of this system was impossible. It was given two trials, however, to indicate whether or not it had any practical possibilities.

For these tests the author made up an original dance and wrote it down in symbols of this choreography. Copies of this dance, together with written explanations of the system, were given to two college women who were members of Orchesis (the honorary dancing society.) At no time did they see the particular dance in question, but were required to work it out alone from the written directions.

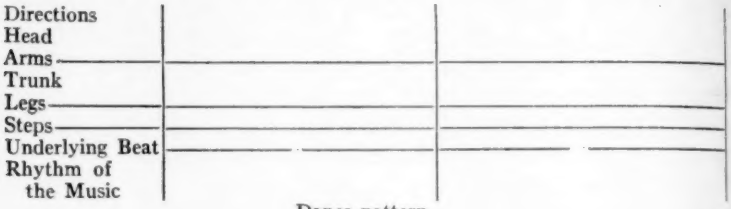
The actual test took place on two different occasions before small groups of interested persons. In each test, screens were set up dividing the room into halves. The writer and one of the others who had studied the written version performed the dance simultaneously on opposite sides of the screens. The spectators were seated so that they could see and compare the two versions, while neither dancer could see the other.

The opinion of the audiences at the conclusion of both trials was that there was a marked similarity between the two versions of the dance and that the greatest differences were in details rather than in the funda-

mental movements involved. They held the belief that these demonstrations of the choregraphy indicated that it had possibilities for practical use.

IV. AN EXPLANATION OF A NEW CHOREGRAPHY

In this system of choregraphy a "dance pattern" is used, which is a certain form upon which may be written all instructions for the dance. In this dance pattern all horizontal space is an indication of time.



Dance pattern

On the horizontal level marked "Directions" are to be written all instructions as to tempo, character of movements (e.g., whether strong or relaxed), and similar matters.

On the horizontal levels marked "Head," "Arms," "Trunk," and "Legs," are to be put all signs for movement of these parts. Directions pertaining to the left arm or leg are placed above the horizontal line, and directions for the right arm or leg are placed below the horizontal line on the "Arm" or "Leg" level.

On the horizontal level marked "Steps" are to be placed all directions concerning the steps taken.

On the horizontal level marked "Underlying Beat" should be placed the underlying beat, which is the series of even rhythmic impulses which lies beneath all the more complex rhythm which may enter into the dance.[2]

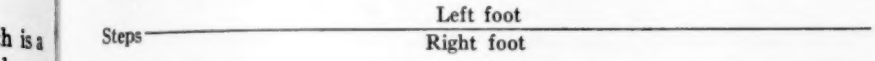
The horizontal level marked "Rhythm of the Music" is not strictly necessary, but in many cases it will probably be helpful. The rhythmic pattern of the music or other means used to accompany may be placed on this level, or the score of the music may be given in the same place instead. This is for the purpose of making it easier to keep one's place when following the choregraphy.

The vertical lines are bar lines, similar to those in music, for the purpose of grouping the underlying beats. In the space before the first bar line the time signature of the accompaniment used (if any) should be given on the "Directions" level. In the same space, on the appropriate levels, should be given directions for moving to the position from which the dance starts.

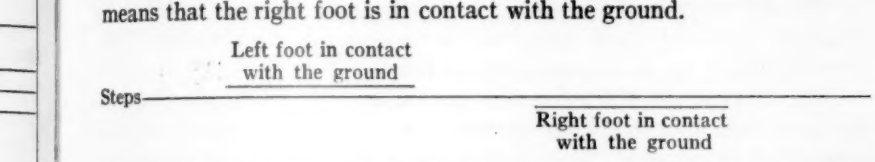
[2] The idea of an underlying beat recorded in this same form is found in *Fundamentals of Rhythm and Dance* by Betty Lynd Thompson.

A. The Representation of Steps

All steps are shown on the level marked "Steps." All steps shown above the horizontal line are taken by the left foot and all those shown below the horizontal line are taken by the right foot.

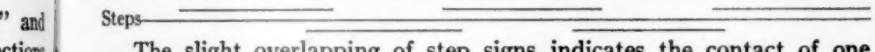


In indicating steps, a line means that the foot is in contact with the ground. A line above the continuous central step line means that the left foot is in contact with the ground. A line below the central step line means that the right foot is in contact with the ground.



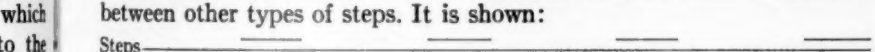
The Kind of Step.—All steps may be analyzed into one of four types: walk, run or leap, hop, and jump.

A walk is a step with a transfer of weight from one foot to the other, in which one or both feet are on the ground all of the time. It is shown:



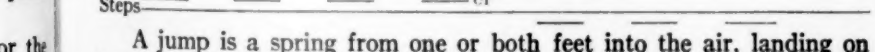
The slight overlapping of step signs indicates the contact of one or both feet with the ground all of the time, the distinguishing feature of a walk.

A run or leap is a step with a transfer of weight from one foot to the other in which the body is not in contact with the ground during the transfer. The words run and leap are used synonymously for the same step, there being no such distinction between them as there is between other types of steps. It is shown:

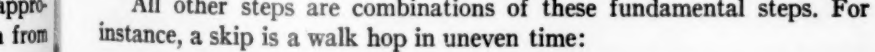


The spaces between step signs indicate that neither foot is on the ground.

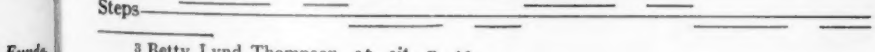
A hop is a series of springs from either foot to the same foot. There is no transfer of weight from one foot to the other, and the body is lifted entirely off the ground between steps.[3] It is shown:



A jump is a spring from one or both feet into the air, landing on both feet.[4] The body is lifted entirely off the ground. It is shown:



All other steps are combinations of these fundamental steps. For instance, a skip is a walk hop in uneven time:



[3] Betty Lynd Thompson, *op. cit.*, p. 43.
[4] *Loc. cit.*

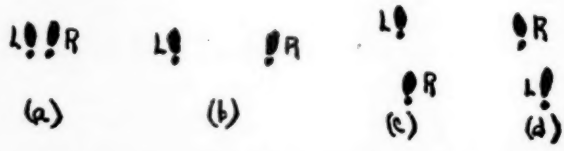
The Length of the Step.—The length of the step is indicated by lines as follows:

A single line———— indicates a small step.
A double line═══ indicates a medium sized step.
A triple line≡≡≡ indicates a large step.
A heavy black line▬▬▬ indicates a very large step.

The length of the step is judged from the foot which does not move, or in case of a hop or jump, from the location of the last contact with the ground.

The Direction in Which the Step Is Taken.—A step may be taken in place, to the front, back, right, left, or in intermediate directions. The direction faced by the dancer is always front.

The direction in which the step is taken is judged from the supporting foot. For example, if from position (*a*) the right foot moves to position (*b*) it moves right; if to position (*c*) it moves back; if to position (*d*) it moves front and left.



If the step is a hop or jump the direction is judged from where the foot was last in contact with the ground.

Whether the foot points to the right or left, in or out, will be determined by the directions given on the leg line.

The name of the direction in which the step is taken is written next to the line indicating the step. Those of the left foot are written above the line, those of the right foot are written below the line.

Steps: front, close, left, front / right, back, close

The word "close" indicates that the moving foot takes a position beside the other foot, as in (*a*) above.

After these symbols are learned, these directions may be indicated by their initials. An intermediate direction is indicated by two directions connected by a hyphen.

Steps: front-left / front-right or f-l, f-l / f-r, f-r

An intermediate direction which is more front than right or left, for instance, would be indicated:

Steps: f-f-l, f-f-l, f-f-l / f-f-r, f-f-r, f-f-r

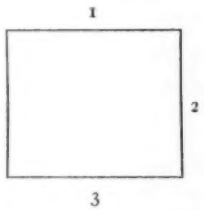
If a series of steps is all in the same direction, e.g., all toward the front, the direction is given only once and is understood to continue until another sign is given.

front back front

In the above example the first four steps are taken to the front, the second four to the back, etc.

If the steps are taken in place, the word "place" is used instead of front, back, right, left, or close.

The Direction Faced by the Dancer.—The four sides of the dancing space are arbitrarily labelled 1, 2, 3, and 4.[5]



The appropriate number, encircled, is placed near the step pattern, and indicates which of these directions the dancer is facing at the moment.

(1) front (2) (3) (2)

This example indicates that the dancer faces direction 1, takes one step forward, faces direction 2 (makes a quarter turn to the right), takes two steps forward, faces direction 3 (makes a quarter turn right), takes one step forward, faces direction 2 (makes a quarter turn left), and takes another step forward. It is important to remember that forward, or front, is the direction faced at the moment.

The word "up" is used instead of a number to show the direction faced when the dancer is lying on his back, and the word "down" when the dancer is lying on his face. In such cases the direction in which the head points may be indicated at the same time by an encircled number.

An intermediate direction is shown by two or more numbers connected by hyphens, as (1-2), (4-1), (2-2-1), etc.

In dances in which the floor pattern, or path covered by the dancer, is very complicated or is not sufficiently clearly shown by the direction faced by the dancer and the direction in which the steps are taken, a separate drawing of this floor pattern should be given, similar to those which are used to describe folk dances. This is especially necessary where there are two or more dancers.

Turns are indicated by a series of consecutive numbers quickly following each other.

[5] This general idea was taken from Feüillet's system of choregraphy.

(3) place (2) (1) (4) (3) (2) (1) (4) (3) (2) (1)

This example indicates two and one-half turns in place to the left.

The Height of the Step.—In walking, the height of the step being determined by the movement of the upper leg, it is shown by the directions given on the leg line.

This is not so in the case of a run or leap, hop, or jump. For these steps, height is indicated by the length of time that the feet are not in contact with the ground. The longer the interval in which the feet do not touch the ground, the higher the step must be. Horizontal space on the dance pattern always indicates length of time.

This example indicates high leaps not covering much distance. The small distance is shown by the single line used to show each step, and the height by the relative amount of time that the body is in the air.

This example indicates long leaps, but very little height, as all the time between contacts with the ground is taken up with covering distance.

Whenever great height is attained or great distance covered in a run or leap, hop, or jump, the time off the ground is proportionately greater than the time of contact.

Weight Bearing.—If only one foot is touching the ground, it is naturally assumed that the weight of the body is borne on this foot. If both feet are on the ground, the weight may be evenly divided between them, or it may be centered on either foot.

A circle on a line ——o—— is the symbol of weight bearing.

A symbol of weight bearing on a line showing contact of a foot or other part of the body with the ground indicates that more weight is borne here than at other points touching the ground. If there is no symbol of weight bearing, and there is more than one point of contact with the ground, the weight is assumed to be evenly divided between these points.

——o——

In the above example both feet are on the ground, the weight being borne mainly by the left foot.

A cross on a line ——x—— cancels a previous weight bearing sign.

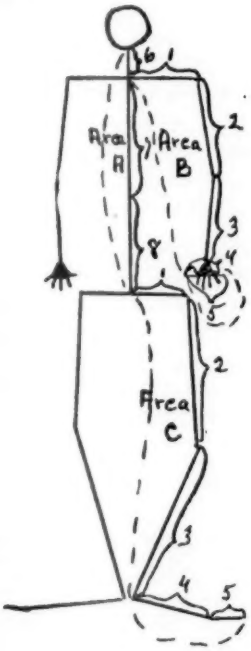
B. The Representation of Body Positions and Movements

The Parts of the Body.—The accompanying diagram is given to show how much is included under the names of various parts of the body.

Movement of a part means motion at the end of that part which is nearest the center of the body or in a joint inside that part, e.g.,

movement of the upper arm is movement at the shoulder joint, while movement of the trunk is movement between joints in the spinal column.

The Normal Positions of the Parts.—Every movement must have a point from which it is understood to start, in order to be definitely oriented in space. For this reason arbitrarily chosen "Normal positions"



Area A—The Trunk

Area B—The Arm

Area C—The Leg

In the trunk:
- 6—the neck
- 7—the upper back
- 8—the lower back

In the Arm:
- 1—the shoulder
- 2—the upper arm
- 3—the lower arm
- 4—the hand
- 5—the fingers

In the Leg:
- 1—the hip
- 2—the upper leg
- 3—the lower leg
- 4—the foot
- 5—the toes

are designated for each part, from which movements are assumed to start.

The Normal positions so designated are:

Head.—The head is upright and facing straight forward.

Trunk.—The trunk is upright and facing straight forward. It is the position assumed in easy good posture with the chest high and the abdomen flat. This includes the Normal positions of the various portions of the trunk (neck, upper back, and lower back).

Shoulder.—The shoulders are in the position which is assumed when the chest is high as in natural, easy, good posture.

Upper Arm.—The arm is hanging naturally at the side.

Lower Arm.—The elbow is straight. The inside of the wrist is facing the body when the arms are hanging at the sides. (In the same Normal position of the forearm the inside of the wrist faces downward when the arm is raised to the side, and faces away from the body when the arm is raised overhead.)

Hand.—The hand is in line with the lower arm, and the wrist is straight.

Fingers.—The fingers are bent very slightly, the fingers are close together, and the thumb is fairly close to the index finger. All fingers are in an easy, relaxed position.

Hips.—The hips are level from side to side, and are vertically in line with the rest of the body.

Upper Leg.—The upper leg is in the position held in ordinary standing, with the weight divided equally between the two feet. The front of the leg is facing directly forward.

Lower Leg.—The knee is very slightly bent.

Foot.—The heel and toes are both touching the ground as in weight bearing. The toes are pointed straight ahead.

Toes.—The toes are in a natural position as when the whole foot is on the ground and is bearing part of the body weight.

The Means of Showing Movement.—The following terms, or combinations of them, are used to describe all movements of all parts of the body; but they do not apply to directions faced by the dancer, directions in which steps are taken, right or left sides of the body, or any other matters. The words so used are:

Fore, pos, dext, sint, bas, leve, tor, olt, en.[6]

The movements described below start from the Normal position of the part in question.

Fore carries with it the general idea of front, although it does not necessarily mean movement in a forward direction. It specifically means:

For the head—bending forward from the Normal position.
For the trunk—relaxing the trunk and letting the back become rounded, so that the hips and shoulders are brought closer together.
For the shoulder—moving forward.
For the upper arm—moving toward the front without a vertical change in plane.[7]
For the lower arm—bending the elbow.
For the hand—bending the hand forward at the wrist so that the palm is closer to the lower arm.
For the fingers—bending as in clenching the fist.
For the upper leg—moving to the front without a vertical change in plane.[8]
For the foot—bending the ankle so that the toes point upward.
For the toes—bending so that they point upward.

Pos carries with it the general idea of back, although it does not necessarily mean movement in a backward direction. It specifically means:

For the head—bending backward.
For the trunk—bending backward.

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[6] Pronounced fôre, pōs, dĕxt, sĭnt, bās, lēve, tôr, ōlt, ĕn. The diacritical markings are those given in *Webster's Collegiate Dictionary.*

[7] This movement is an exception to the rule that the movements described here start from the Normal position. These exceptions are taken from any position other than the Normal.

[8] *Ibid.*

For the shoulder—moving backward.
For the upper arm—moving toward the back without a vertical change in plane.[9]
For the hand—bending backward at the wrist.
For the fingers—straightening backward from the Normal position.
For the hips—pushing backward with the hips.
For the upper leg—moving toward the back without a vertical change in plane.[10]
For the lower leg—bending the knee.
For the foot—straightening the ankle so that the toes point downward.
For the toes—curling under.

Dext carries with it the general idea of the right. It specifically means:

For the head—bending to the right side.
For the trunk—bending to the right side.
For the upper arm—moving toward the right side of the body with no change in vertical plane.[11]
For the hips—swinging to the right side.
For the upper leg—moving toward the right side of the body with no change in vertical plane.[12]

Sint carries with it the general idea of the left. It specifically means:

For the head—bending to the left side.
For the trunk—bending to the left side.
For the upper arm—moving toward the left side of the body with no change in vertical plane.[13]
For the hips—swinging to the left side.
For the upper leg—moving to the left side of the body with no change in vertical plane.[14]

Bas carries with it the general idea of lowness. It specifically means:

For the shoulder—lowering or dropping the shoulder.
For the hips—dropping or pushing down with the hip.

Leve carries with it the general idea of height. It specifically means:

For the shoulder—raising the shoulder, as in shrugging the shoulders.
For the hip—raising or pulling with the hip.

Olt carries with it the general meaning of outward. It specifically means:

For the hand—bending to the side of the little finger.
For the foot—turning the foot so as to toe out.
For the fingers—spreading the fingers apart.

En carries with it the general meaning of inward. It specifically means:

For the hand—bending to the side of the thumb.
For the foot—turning the foot so as to toe in.
For the fingers—closing all spaces between the fingers.

Tor carries with it the general idea of twisting. It is always used with another word, *dext*, *sint*, *olt*, or *en*, to denote in what direction the twisting takes place.

9–12 *Ibid.*
13–14 *Ibid.*

Tor-olt means:

For the upper arm—twisting out away from the body.
For the lower arm—twisting so that in the normal position of the arm the thumb side of the hand turns away from the body.
For the upper leg—twisting out away from the body.

Tor-en means:

For the upper arm—twisting in toward the front of the body.
For the lower arm—twisting so that in the Normal position of the arm the thumb side of the hand turns toward the body.
For the upper leg—twisting in toward the front of the body.

Tor-dext means:

For the head—twisting so as to face to the right.
For the trunk—twisting so as to face to the right.

Tor-sint means:

For the head—twisting so as to face to the left.
For the trunk—twisting so as to face to the left.

The range of the movements of the upper arm described under *Fore-leve*, *Pos-leve*, *Dext-leve*, *Sint-leve*, *Fore-dext-leve*, and *Fore-sint-leve* is from the Normal position to a position directly above the head.

Fore-leve means:

For the upper arm—raising forward and upward.
For the upper leg—raising forward and upward.

Pos-leve means:

For the upper arm—raising backward and upward.
For the upper leg—raising backward and upward.

Dext-leve means:

For the right upper arm—raising sideways and upward.
For the right upper leg—raising sideways and upward.

Sint-leve means:

For the left upper arm—raising sideways and upward.
For the left upper leg—raising sideways and upward.

Fore-dext-leve means:

For the left upper arm—swinging across in front of the body and upward.
For the left upper leg—swinging across in front of the body and upward.

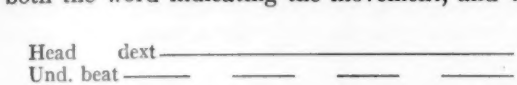
Pos-dext-leve means:

For the left upper arm—swinging across in back of the body.
For the left upper leg—swinging across in back of the body.

Fore-sint-leve and *Pos-sint-leve* are movements analogous to the two immediately above, executed by the right upper arm or right upper leg.

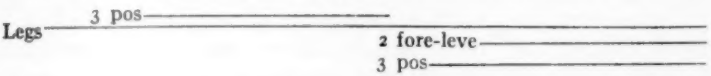
Any movement of any part of the body is indicated by writing on the appropriate level the word for the movement, followed by a straight horizontal line for the duration of the movement. The length of time necessary to complete the movement includes the horizontal space con-

sumed by both the word indicating the movement, and the line which follows.



In this example the movement takes four of the underlying beats for its completion.

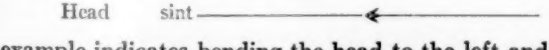
In showing a movement of one part of a member of the body, such as the foot (a part of the leg), use is made of the numbers given each part in the section "Parts of the Body," above. Movement of several parts of the same member of the body may be shown at once.



In the first part of the above example, the left leg bends at the knee during the length of time indicated by the line. Movement of the leg is indicated by putting the signs at the proper levels on the dance pattern. The left leg is indicated by putting the sign on the upper side of the line. Movement of the lower leg is indicated by the number 3. Bending the knee is indicated by the word "pos." The length of time necessary to complete the movement is indicated by the length of the line.

In the second part of the example, the right leg is raised forward and upward, and the right knee is bent simultaneously. The right leg is indicated by putting the signs below the line. Movement of the upper leg is indicated by the figure "2." Raising the leg forward and upward is indicated by the words "fore-leve" following the sign for the upper leg. The lower leg is indicated by the figure "3." Bending the knee is indicated by the word "pos" following the number for the lower leg. The simultaneity of the two movements is indicated by putting one sign directly below the other.

The movements which have been described all start from the Normal position. For each of these there is a corresponding movement in the opposite direction by means of which the part is returned to the Normal position. All such movements are indicated by the sign of the appropriate movement from the Normal position, followed by a reverse arrow on the movement line. The reversal of movement starts at the point where the arrow is placed on the line.



This example indicates bending the head to the left and then raising the head to the Normal position.

The end of any movement line indicates that the movement is stopped and the position reached through this movement is held.

Movement of one part may cause movement of other parts; e.g., when the upper arm is raised to the side, the forearm, hand, and fingers

are also moved; but unless directions are given for moving these parts separately they continue in the same relation to the upper arm which they had previously.

If a part moves from its Normal position, does not return to the Normal position, and another movement direction is given; the part moves directly to the position in which it would be if the second movement were taken from the Normal position. For instance, if the direction "fore" were given for the head, followed by the direction "dext," the head would move from a front bend to a right bend without returning to the Normal position.

In a movement which is composed of two others, such as raising the arm diagonally left front, the directions for the two movements would be combined, being in this case "fore-sint-leve." If the movement is more forward than left, the predominant word would be repeated, as "fore-fore-sint-leve."

After these words are well known, their initials may be substituted, especially in the case of long combinations such as in the previous paragraph.

If no movement direction is given for a part, it is assumed to be in its Normal position.

Amplitude of Movements.—The amplitude of a movement is indicated in a manner similar to that of showing the length of steps.

A single line ——— indicates a movement approximately one-fourth of the entire range of movement possible.

A double line ═══ indicates a movement approximately one-half of the entire range of movement possible.

A triple line ≡≡≡ indicates a movement approximately three-fourths of the entire range of movement possible.

A heavy black line ▬▬▬ indicates movement through the entire range of movement possible.

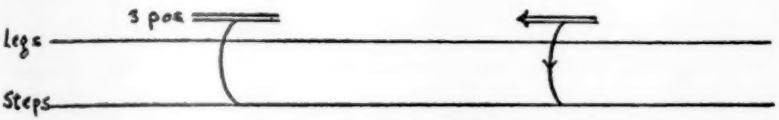
Contact Between Parts of the Body.—Contact between various parts of the body is indicated by a curved vertical line, (, drawn between the levels of the two parts.[15]

Termination of this contact is shown by the same sign with an arrow on it

[15] This method of denoting contact was taken from Laban's system of dance writing.

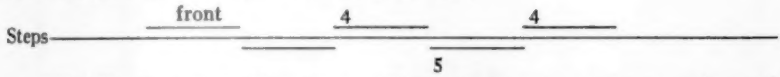
The above example shows movement of the right arm to a position where the right hand touches the trunk, and a return to the Normal position.

The step line also indicates the ground. Contact with the ground is shown by a contact line between the part touching and the center step line.



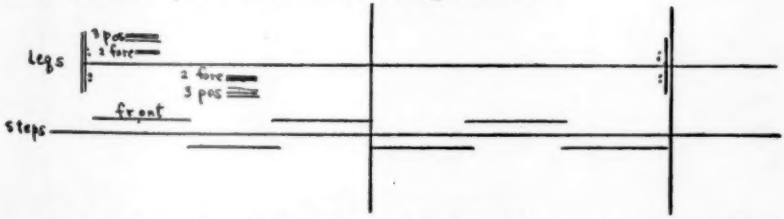
This example shows contact of the left lower leg with the floor (kneeling on the left knee), and rising from that position.

Contact of the heel only with the ground is indicated by the figure 4 on the line drawn to show the step, 4 being the number which denotes the foot. Contact of the toes only with the ground is shown by the figure 5 on the line of the step, 5 being the number which denotes the toes. (See diagram of parts of the body page 53.)



Miscellaneous Considerations.—If one dances to spoken words, and the underlying rhythmic beat is not felt strongly enough to follow, the rhythmic pattern of the words spoken may be used instead, shown by long and short dashes. The rhythm of the movements of the dance is then shown in relation to this underlying pattern.

The movements made by the legs in taking a step are not shown unless there is some special quality about them which needs to be emphasized; for instance, walking with knees raised high at each step, which would be shown in the following manner:

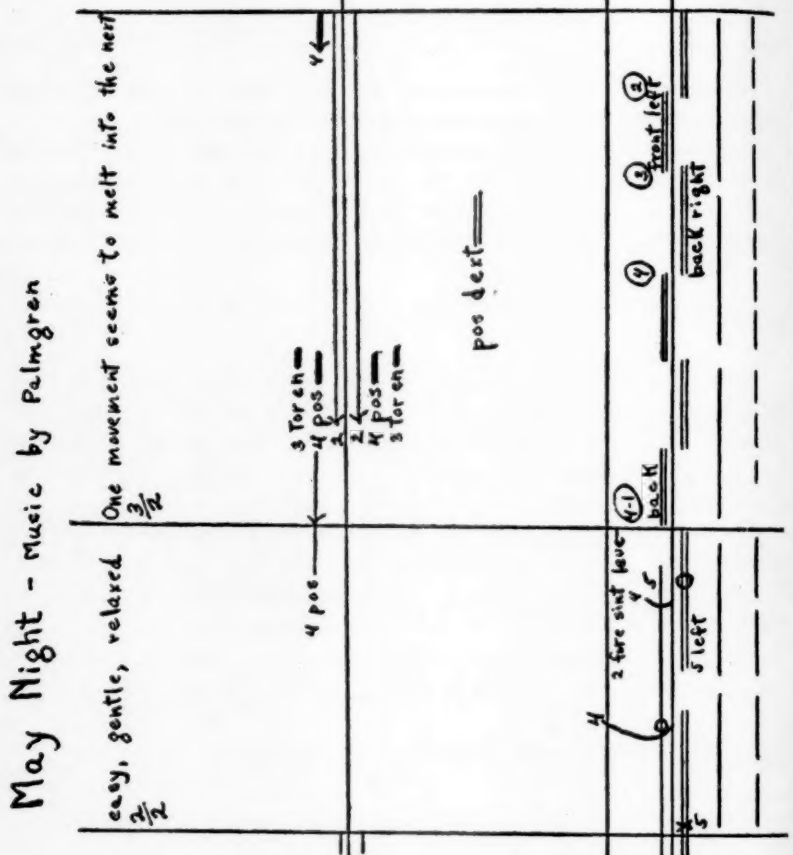


Repeat signs, ||: :|| similar to those used in music, indicate that the pattern demonstrated within these signs is continued through the space of time between the signs.

A short vertical line at the end of a step line means that the step is held, and the foot remains on the ground until another short vertical line is seen.

In the above example the left foot remains on the ground during the interval from *A* to *B*, after which there is a hop to the front on the same foot. This is merely for the sake of preventing unnecessary writing when no steps are taken for a long period of time.

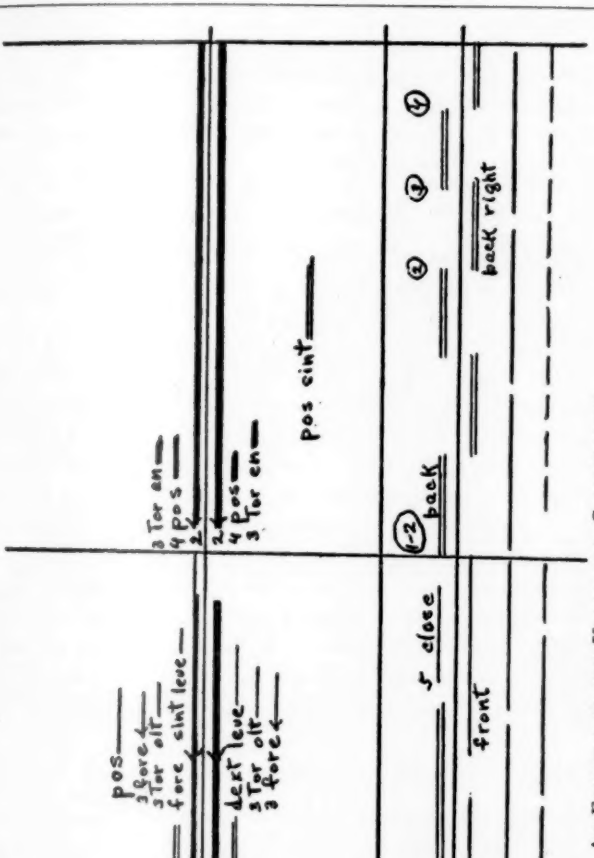
Certain elements of a dance have not been included in this system.



It is to be hoped that they are not the most important points. Among the omissions are the following:

The pattern of sound made by the hands or feet, and the kind of sound made by them.

Facial expressions.



An Example of the Use of the Chorégraphy.

The movement of accessory elements, such as scarfs or balloons.
Costumes, lighting, and scenery.
Means for showing the spatial relations of a group of dancers.
The movement of separate fingers.
This last is of importance in certain Oriental dances, but leads to great complexity in dance writing, and on the whole is not as fundamental a matter as the larger body movements. It should, however, be provided for in a truly complete system of choregraphy.

This system of signs may be used either in whole or in part. For instance, it might be desirable to show only arm motions with the underlying beat. In such a case the appropriate parts of the dance pattern would be abstracted and used alone.

V. EPILOGUE

The system of choregraphy described above is in need of at least two things. The first of these is use in many different situations to discover just how practical such a system is.

The second is revision and improvement of the devices used to give directions for the dance. The writer is fully aware of the existence of specific weaknesses in this system of choregraphy. Included among these are the use of the word "fore," and the figure "1," either of which may be confused with other directions; the inadequacy of the means for showing the size of a movement and the height of a step; the use of the term "Normal position"; and other matters. Better devices should be substituted in all these cases.

A truly satisfactory dance notation will probably take a long time to evolve, will undergo many changes along the way, and will have to develop gradually, a step at a time. It is the hope of the author that sometime in the future an adequate system of dance notation will be in general use and will make possible a greater development of the art of dancing.

BIBLIOGRAPHY

Arbeau, Thoinot. *Orchesographie,* 1588. Paris: F. Vieweg, 1888.

Feüillet, Raoul Auger, and Dezais, Sr. *Choregraphie.* Paris: Dezais, 1713.

—— *Recueil de Dances Composes Par M. Feüillet.* Paris: Chez l'Auteur, 1709.

—— *Recueil de Dances Composes Par M. Pecour.* Paris: Chez l'Auteur, 1709.

Kool, Jaap. *Tanz-Schrift.* Bordeaux: Duvignau-Canet, 1927.

Laban, Rudolf von. *Script Dancing,* Vols. I and II. Wien-Leipzig: Universal Edition, 1930.

Zorn, Friedrich Albert, *Grammar of the Art of Dancing.* Boston: Heintzmann Press, 1905.

Beaumont, Cyril W. *A Bibliography of Dancing.* London: The Dancing Times Ltd., 1929.

Humphrey, Doris, "Handwriting on the Wall," *Journal of Health and Physical Education,* (Nov., 1933).

Thompson, Betty Lynd, *Fundamentals of Rhythm and Dance.* New York: A. S. Barnes and Co., 1933.

Preliminary Study of Criteria for the Selection and Organization of Learning Experience in Health Instruction*

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The Ohio State University

EDUCATIONAL psychology and philosophy lend much to the techniques and substance of health instruction. Most effective teaching of hygiene can go forward only in accordance with what is known and believed about the learning process. Courses of study, textbooks, units of work, syllabi, elements in a core curriculum, all should organize the learning experiences of the student according to the known facts or beliefs as to how people learn.

It is upon this basis that the following criteria are submitted for consideration. Some references are given. These may be helpful in explaining the background for the criteria.

CRITERIA

1. The content material must be scientifically accurate throughout and in thorough accord with the best available knowledge in the biological sciences.

2. The experiences should foster the concept of health as a qualitative result of the interdependent functioning of all the vital systems, involving the mental and social aspects of living as well as the physical.

a) Wile, Ira S. "The Whole Child as a Health Unit." *Am. Jr. of Public Health.* XVII: 1 (Jan., 1927), 20.

b) Wile, Ira S. "The Relation of Intelligence to Behavior." *Mental Hygiene.* X: 1 (Jan., 1926), 26.

c) Williams, J. F. *Personal Hygiene Applied.* 5th Edition, Ch. 1. Philadelphia: W. B. Saunders Co.

3. The experience should constantly interpret health from a social point of view, explaining health in terms of its social uses.

a) Williams, J. F. "Health an Objective of Education." *Jr. of Health and Physical Education.* IV: 3 (Mar., 1933), 5.

b) Williams, J. F. *Personal Hygiene Applied.* 5th Edition, Ch. III. Philadelphia: W. B. Saunders Co.

4. The experiences should be selected in response to data from student life which indicate the needs and interests of the learners, and not chosen solely in terms of what course makers believe should be included.

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* A paper presented before the Health Education Section of the American Physical Education Association Convention, April 26, 1935, at Pittsburgh, Pa.

The experiences should be drawn out of, identical with, or linked to the life of the learner.

a) McCall, W. A. "My Philosophy of Life and Education." *Teachers College Record*. XXXVI: 5 (Feb., 1935), 409.

b) Hollingsworth, H. L. *Educational Psychology*. New York: D. Appleton Co., 1933.

c) Woodworth, R. S. *Contemporary Schools of Psychology*. Ronald Press Co., 1931.

d) *The Educational Frontier*. Edited by W. H. Kilpatrick. New York: Century Co., 1933.

e) Oberteuffer, D. *Personal Hygiene for College Students*. New York: Bureau of Publications, Teachers College, 1930.

f) *Twenty-sixth Year Book of the National Society for the Study of Education*. Part II. p. 13. Bloomington: Public School Publishing Co., 1928.

g) Weeden, Vivian. "A Technique for Determining Interest." *Educational Research Bulletin*. The Ohio State University (Dec. 12, 1934).

h) Raup, R. B. *Complacency*. New York: Macmillan Co., 1926.

5. The experiences should be arranged on an activity basis, giving constant opportunity for healthful practice, and aimed more at the development of conduct than at the acquisition of knowledge.

a) "Basic Principles in the Psychology of Learning." P. M. Symonds in *Principles and Practice in Health Education*. p. 274. American Child Health Association, New York, 1931.

b) Gates, Arthur I. *Psychology for Students of Education*. New York: Macmillan Co.

c) Warnock, Florence M. "Opportunities for Teaching Health Through Motor Activities." *Jr. Health and Physical Education*. V: 8 (Oct., 1934), 15.

6. The order of thought presentation should be from the particular to the general, each new principle, abstraction or generalization being developed through intimate, concrete, individual experience before reaching its final form.

a) Woodworth, R. S. *Contemporary Schools of Psychology*. New York: Ronald Press, 1931.

b) Dewey, John. *How We Think*. New York: D. C. Heath and Company, 1933.

c) Thorndike, E. L. *The Psychology of Arithmetic*. p. 154. New York: Macmillan Co.

d) Kilpatrick, W. H. *The Foundations of Method*. New York: Macmillan Co.

e) Symonds, P. M. *The Nature of Conduct*. p. 316. New York: Macmillan Co., 1928.

7. There should be an abundance of material of varying difficulty so as to admit of choice suited to the needs of the individuals who differ in capacity and experience.

a) Bode, Boyd H. *Modern Educational Theories*, p. 218. New York: Macmillan Co., 1930.

8. The experiences selected should be progressively graded so as to provide for continuous growth in healthful living and, if possible, reliable instruments of measurement should be applied to note the progress of each learner.

a) Tyler, Ralph W. *Constructing Achievement Tests*. Columbus, Ohio: Ohio State University Press, 1934.

b) Thurstone, L. L. "Attitudes Can Be Measured," *Am. Jr. of Sociology* (Jan., 1928), 529.

c) Dewey, John. *Democracy in Education*, p. 257. New York: Macmillan Co., 1926.

9. Frequent periods for review should be interspersed throughout the course, and if, and when, examinations, quizzes, or tests are used they should be analyzed afterwards with the class.

a) Jersild, A. T. "The Examination as an Aid to Learning." *Jr. of Educ. Psy.* XX: 8 (Nov., 1929), 602.

b) "Health Education." *Report of Joint Committee of N.E.A. and A.M.A.* Second Edition, Ch. V, Section E, p. 144.

10. There should be provided in connection with each major thought division an up-to-date series of standard and reliable references, so arranged as to stimulate in the student a desire for a widening of his interest and knowledge.

a) Oberteuffer, D. *Ohio Physical and Health Education Series*, Vol. III, Ch. VII. Columbus: Ohio Department of Education, 1932.

b) Reckmeyer, Luella. "Collateral Readings for Use in the Teaching of Health," *Supplement to the Research Quarterly*. V: 1 (March, 1934), 99.

11. The general tone of the experiences with respect to all controversial issues should be one of discreet judgment, free from prejudice or inaccurate content. The learnings should never be colored with emotional bias for want of scientific data.

a) Williams, J. F. "My Philosophy of Education." *Teachers College Record*, (March, 1935).

12. The experiences should require a mastery of a minimum of scientific terminology, enough to handle the ordinary health processes intelligently.

a) Oberteuffer, D. *Personal Hygiene for College Students*. Ch. V. New York: Bureau of Publications, Teachers College, 1930.

b) Dewey, John. *How We Think*. p. 179. New York: D. C. Heath and Co., 1933.

13. The experiences should provide frequent and specific opportunity for correlation with other areas in the curriculum and with other parts of the health education program.

a) Oberteuffer, D. "Education in the School Health Program." *Public Health Nursing*. XXVI: 9 (Sept., 1934), 489.

b) Wood, T. D. "The Essentials of a School Health Program." *Principles and Practice in Health Education*, p. 383. 1930.

c) *Health Trends in Secondary Schools*. American Child Health Association.

14. The activities of the course should lead to cooperation and understanding between the school and the home and community.

a) Bailey, Edna. "A Tuberculosis Survey in a Junior High School as a Means of Health Instruction." *University High School Jr.* XII: 4 (March, 1933), 196.

b) *Advances in Health Education*, pp. 39, 141, 267. American Child Health Association, 1934.

The Effect of Certain Recuperative Procedures on Recovery from Fatigue

By Joseph A. Amori
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INTRODUCTION

Statement of Problem.—With the growth of competitive forms of athletics, numerous recuperative procedures have been devised and employed during rest periods as means of relieving the body of the products of fatigue[7]* which accumulate during an initial period of muscular exertion, the purpose being to allow the athlete to return either to the original or to a second activity with as fresh a set of muscles as possible. The most widely used methods of recuperation from muscular fatigue can be classified under three main headings: (1) body posture, including sitting, standing, and the reclined positions; (2) hot and cold showers; and (3) massage. Various combinations of these procedures also have been employed; for example, a hot shower for several minutes, followed by a cold shower, concluded by a massage; or the reclined position with the employment of massage.

No systematic study has been attempted to obtain an accurate measurement of the effect on muscular efficiency of these procedures. In the past, estimations of the effect usually have been subjective in nature, the coach or trainer relying on the judgment of the individual being studied. Only occasionally have any measurements been made of the changes in muscular output and these always have been scattered and unsystematic. As a consequence opinions vary as to the relative merit of these recuperative procedures.

The purpose of the present investigation is twofold: (1) to determine the recuperative value of each of these factors as indicated in accurate measurements of the muscular output following the application of the procedure, each test to be preceded by an initial work period; and (2) to offer an explanation of the physiological changes resulting from the use of these procedures as such changes are indicated in measurements of blood pressure and temperature.

History of Rest Pauses.—No study of fatigue relative to recovery after work would be complete without a brief survey of the experiments which have been conducted in the field of rest pauses up to the present

* Numbers refer to bibliography at end of article.

time. The first important study of recovery during rest was made by Maggiora.[18] The activity he used involved the raising of a six-kilogram weight, at various rates, by the flexor muscles of the middle finger of both hands. He found that when the load was lifted once every ten seconds the maximum height of contraction could be maintained indefinitely. If after half an hour of work with a rhythm of ten seconds, work was done at a two-second rhythm, the record thus obtained showed no difference, either in the form of the curve or in the amount of the mechanical work, from another record made by the same muscle after being completely rested.

Maggiora also made a study of the rest pause necessary between periods of work to maintain output constant throughout the day. His findings showed that a rest pause of two hours is "sufficient to prevent the accumulation of fatigue and to secure from the muscles in the evening as well as in the morning the quantity of mechanical work which they are capable of producing under conditions of complete rest."

Another early study of the field of recovery was that of Wallrich and Dawson.[25] By studying the effect of rest pauses on work done upon a bicycle ergometer they concluded that with light loads rest pauses are a nuisance, with average loads they are indifferent, and with heavy loads rest pauses are favorable to production of work.

U. Mosso[20] made a study of the effect of general fatigue upon muscular work, studying rest pauses only incidentally. He performed work to exhaustion, using the middle finger of the right hand to raise a load of 4 kilograms. He employed a series of 7 work periods with a rest pause of 4 minutes between each 2. The first series was performed after a sleep of several hours. The total output for the series was 15.808 kilogram-meters of work. After a 2,515-meter climb of 4 hours in the mountains, Mosso once again performed a series; the total points out "that the poisons which are developed in a moderate fatigue, while they depress the muscles, have no influence on the amount of energy which is there accumulated." As a final conclusion he maintains that "the poisons of moderate fatigue diminish the activity of the muscles and they disappear from the organism in about ten minutes."

A great many investigations have been conducted in the field of industrial fatigue during the past twenty-five years, but the results obtained have only a slight bearing on our problem. Vernon[24] made a study of the rest pauses voluntarily taken by men working at a tin-plate manufacture. He found that men taking rests at regular intervals produced more output than those working without rest pauses. Loveday[17] experimenting with rest periods in the boot and shoe industry found similar results.

Even though some work has been done in the field of recovery from fatigue, no study has yet attempted to determine ways and means of

either facilitating or inhibiting the recovery process after an initial period of work.

CHAPTER I

METHODS AND PROCEDURE

It was found that the recuperative effects of the various procedures could best be shown if the type of work used involved the activation of a great many of the larger groups of muscles. The activity of rowing in a regulation rowing machine fulfilled this requirement. The subject was seated upon the sliding seat with his feet strapped into the foot rests. A cord was attached at the middle of the oar and extended through pulleys to a weight of 175 pounds. The subject would reach forward and grasp the oar, then, extending himself backward as in rowing, would raise the weight a distance of 30 inches with each stroke.

The initial work period consisted of 1 minute of rowing, using a stroke of 22, which with the 175-pound weight resulted in 9,695 foot-pounds of work. In order that the work should remain constant from one subject to another, it was necessary for the subject to pull at a uniform rate of speed and through an equal distance throughout this period. The rhythm was indicated by the ticking of a metronome and also by the swinging of its pendulum. After the initial work period the subject was given a 5-minute recovery period during which he submitted to one of the respective recuperative procedures. At the end of this period he was seated again in the rowing machine, the weight was increased to 250 pounds, and he rowed at the rate of 22 strokes a minute until exhausted.

In the first part of the experiment no measurements were made of the amount of actual work done, the number of seconds of work up to the time of exhaustion being taken as proportional to the total amount of work. The time was recorded by means of a stop-watch. With the subject pulling at a constant rate this time record was a rather accurate index of the work accomplished. Six subjects participated in this part of the experiment and tests were made of the effects of the following recuperative procedures: (1) sitting position, (2) standing position, (3) reclined position, (4) hot shower, (5) cold shower, and (6) massage.

Each individual was subjected to a different recuperative procedure each day, the order of the procedures being different for each subject.

During the last part of the experiment the excursion of each stroke was transmitted by mechanical levers to a pen which recorded on a variable-speed polygraph.[14] The extent of the movement in terms of centimeters was later transformed into foot-pounds of work. In this latter phase of the work two subjects were used, and two of the recuperative procedures, sitting and standing, were eliminated.

In order to ascertain how two of the physiological mechanisms of the human body were affected during the administration of the respective recuperative procedures, a record was kept of the blood pressure and

body temperature of all the subjects. These readings were taken before and after the initial work period and at the conclusion of the recovery period.

The subjects were eight crew men, all of whom were members of the University of California Varsity Crew. They ranged in height from 5 feet 9 inches to 6 feet 2 inches. Their weights ranged from 165 pounds to 190 pounds. They ranged in age from 19 to 24 years. Each subject participated in every phase of the experiment. Before performing the work of the actual experiment each of the subjects was given a preliminary training in the movements to be used. This training familiarized the subjects with the various parts of the apparatus, and with the directions which they were to follow during the experiment. As all subjects were experienced oarsmen, and as the rowing season was well along before the tests were started, any changes resulting from practice[5] were small and can be ignored.

CHAPTER II

The results obtained (Tables I and II) show that all the subjects produced more output after having spent the five-minute rest pause under massage than after any of the remaining five recuperative procedures. The hot shower proved to be detrimental to performance and is the least effective in relieving fatigue after an initial work period. The cold shower, on the other hand, while not as efficient as massage as a recu-

TABLE I

NUMBER OF SECONDS OF WORK DONE BY SIX SUBJECTS AFTER EACH OF SIX RECUPERATIVE PROCEDURES.—DATA FROM THREE TRIALS EACH SUBJECT

Subject	Recuperative Procedures					
	Massage	Cold Shower	Reclined Position	Sitting Position	Standing Position	Hot Shower
I	75	57	47	45	43.5	40
	78	59.5	48	46	43	39
	76.5	58	48	45.5	44	39
II	65	58	48	47.5	47	41
	66.5	57.5	47	46.5	45.5	40.5
	66	58.5	47	46.5	46.5	40.5
III	62	50	45	43	41	38
	63.2	52	45.5	42	42	37.5
	64	53.5	44.5	42	40	39
IV	61.5	50.5	44	42	41	37.5
	61	51	42.5	42	42.5	38
	62	51	43	43	42	39
V	63	49	43.5	44	43.5	39.5
	62	49.5	43	45	43	38.5
	63.5	50.5	44	45	44	38.5
VI	60.5	48	45	43.5	43	38.5
	62.5	48	44	43	43	36
	61	49	46	42	42.5	39
Mean	65.58	52.81	45.5	43.34	43.38	39.08

perative procedure, ranks higher than the other four. Body posture, in its three aspects, seems to indicate that the reclined position holds a slight advantage in recuperative value over the sitting and standing positions, with the latter the least effective. The differences are small, however, and cannot be said to be significant.

Blood-pressure recordings (Table III) show that there is an increase in pressure after the initial work period. The tables also show that the percentage decrease after the recovery period depends upon the recuperative procedure. Of the six recuperative procedures massage produces the greater pressure decrease.

TABLE II

FOOT-POUNDS OF WORK DONE BY TWO SUBJECTS AFTER EACH OF FOUR RECUPERATIVE PROCEDURES.—DATA FOR THREE TRIALS FOR EACH SUBJECT

Subject	Recuperative Procedures			
	Massage	Cold Shower	Reclined Position	Hot Shower
VII	22,000	17,555	15,000	11,225
	23,245	18,225	15,435	10,589
	21,225	18,000	15,220	11,220
VIII	20,775	16,250	14,425	10,000
	19,995	17,000	14,000	10,575
	21,000	16,524	14,789	9,750
Mean	21,376.4	17,259	14,811.3	10,559.5

TABLE III

BLOOD PRESSURE EXPRESSED IN MILLIMETERS OF MERCURY TAKEN BEFORE AND AFTER THE INITIAL WORK PERIOD AND AFTER EACH OF SIX RECUPERATIVE PROCEDURES. AVERAGE OF THREE READINGS FOR EACH RECUPERATIVE PROCEDURE IS GIVEN.

Subjects	I	II	III	IV	V	VI
Before Wk.	124	126	122	122	122	122
After Wk.	186	178	182	188	188	192
After Hot Shower	138	136	138	138	145	144
Before Wk.	125	125	126	124	122	126
After Wk.	187	180	184	186	190	190
After Cold Shower	161	158	154	150	154	154
Before Wk.	125	126	124	126	128	124
After Wk.	189	182	186	188	190	190
After Massage	135	138	140	138	136	136
Before Wk.	124	128	122	124	126	122
After Wk.	185	182	186	190	192	188
After Sitting Pos.	150	145	150	150	148	148
Before Wk.	126	124	124	122	124	120
After Wk.	190	180	190	186	188	184
After Standing Pos.	165	148	152	148	150	152
Before Wk.	124	124	126	124	126	124
After Wk.	192	182	188	184	186	186
After Reclined Pos.	142	144	152	142	145	142

Increases in body temperature (Table IV) accompany all initial work periods. The data further show that of all the recuperative procedures used the hot shower is the only one which produces a further increase in body temperature in addition to that brought about by the

TABLE IV

BODY TEMPERATURE IN DEGREES FAHRENHEIT TAKEN BEFORE AND AFTER THE INITIAL WORK PERIOD AND AFTER EACH OF FOUR RECUPERATIVE PROCEDURES FOR TWO SUBJECTS. THREE READINGS FOR EACH PROCEDURE.

Subject	I Before Work	II After Work	III After Recuperative Procedure	Differences II–III	Differences I–III
			Cold Shower		
VII	97	98.2	97.2	1.0	.2
	97.5	98	97.3	.7	.2
	97.3	98.1	97.1	1.0	.2
VIII	98	99	98.3	.7	.3
	97.5	98.5	98	.5	.5
	98	98.5	98	.5	.0
			Hot Shower		
VII	97	98.2	99	.8	2.0
	97.5	98.5	99.5	1.0	2.0
	98	98.3	100	1.7	2.0
VIII	98	99	99.5	.5	1.5
	97.5	98.5	99.2	.7	1.7
	98	99.5	101.2	1.7	3.2
			Reclined Position		
VII	97	98	97.2	.8	.2
	97.3	98.3	97.5	.8	.2
	97	98	97.5	.5	.5
VIII	98	99	98	1.0	.0
	98.2	99.2	98.5	.7	.3
	97.5	98	97.5	.5	.0
			Massage		
VII	97	98.2	97.1	1.1	.1
	97.5	98	97.6	.4	.1
	97.3	98.1	97.5	.6	.2
VIII	98	99	98.2	.8	.2
	98	98.5	98	.5	.0
	97.5	98	97.5	.5	.0

initial work period. The application of massage, on the other hand, brings about the greatest decrease in temperature from the high level resulting from the initial work period.

CHAPTER III

A DISCUSSION OF RESULTS

The employment of massage during the recovery period following the initial work is the most efficient recuperative procedure (Tables I and II) of the six used in the experiment, while the hot shower is the least efficient. In between these two extremes is found the cold shower, followed by the three aspects of body posture: sitting, standing, and the

reclining. Of the latter we find the reclined position holding a slight advantage over the remaining two, with the standing position the least effective of the three. The cold shower, on the other hand, ranks next to massage in recuperative efficiency. A comparison of the mean output in terms of seconds of work done (Table I) shows massage giving 65.58, the cold shower 52.81, the reclined position 45.5, the standing position 45.5, the sitting position 43.48, and the hot shower 39.08. Table II giving the output calculated in terms of foot-pounds shows similar results. Massage ranks first with a mean output of 21,376.4, cold shower second with 17,259, the reclined position third with 14,811.3, and the hot shower fourth with 10,559.5.

From these results it is apparent that the subjects were able to continue work for longer periods of time after one recuperative procedure than after another. The question arises as to whether the differences between these procedures are reliable. The differences and the reliability of the differences in terms of the probable error are presented in Table V. The formulas used in deriving these values are those customarily employed:

Mean, or (average)
Probable error of the mean
Probable error of the difference
The probable error (critical) ratio

Since it is usually customary to consider a probable error ratio of four or more as indicative of reliability, it follows that the obtained differences (Table V), with the exception for the difference between the sitting and standing positions, are not only completely reliable, but they are much larger than they need be to insure a true difference greater than zero.

TABLE V

MEAN DIFFERENCES IN SECONDS OUTPUT WITH PROBABLE ERRORS AND PROBABLE ERROR RATIOS OF THE SIX RECUPERATIVE PROCEDURES.

Mean	Difference	Probable Error	Probable Error Ratio
Sitting–Standing	.04	.39	.1
Sitting–Reclined	2.16	.40	5.4
Sitting–Hot Shower	4.26	.34	12.5
Sitting–Cold Shower	9.47	.68	13.9
Sitting–Massage	22.24	.87	25.5
Standing–Reclined	2.12	.39	5.4
Standing–Hot Shower	4.30	.329	13.0
Standing–Cold Shower	9.43	.68	13.86
Standing–Massage	22.20	.87	25.51
Reclined–Hot Shower	6.42	.34	18.8
Reclined–Cold Shower	7.31	.69	10.5
Reclined–Massage	20.08	.87	23.0
Hot Shower–Cold Shower	13.73	.65	21.1
Hot Shower–Massage	26.5	.85	31.1
Cold Shower–Massage	12.77	1.03	12.36

The figures show conclusively that the largest differences always involve massage, while the smallest differences exist between the sitting, standing, and reclined positions. The cold shower differences, while not as large as those of massage, rank second. We are now in a position to bring together the results from the various experiments in an attempt to draw some definite conclusions regarding the findings.

Certain theoretical principles relative to the recovery from muscular fatigue through the employment of these recuperative procedures will be considered. Such physiological principles should prove beneficial in the interpretation of the results obtained.

In the first place, it may be concluded that the phenomena of fatigue, as far as muscles are concerned, result from three things: (*a*) the exhaustion of the energy-producing compounds in the body tissues; (*b*) the presence of waste products, and (*c*) the lack of oxygen.[5] Restoration of energy, with corresponding releases from fatigue, is brought about by: (*a*) the restoration of the energy-producing compounds, (*b*) the renewal of oxygen supply, and (*c*) the removal of waste products. The elimination of these waste substances is effected primarily by means of the circulation of the blood and the lymph[5] and secondarily by means of the lungs, skin, and kidneys.[6]

In accounting for the differences in recuperative efficiency of the six procedures, various explanations have been suggested. These can be considered under five main headings: (1) rise and fall in systolic blood pressure; (2) rise and fall in body temperature; (3) increased and decreased metabolic rate; (4) changes in the composition of blood; and (5) acceleration and deceleration of the circulation. An explanation of the way in which each of these physiological mechanisms is affected during the employment of the respective recuperative procedures may aid in the solution of the problem.

Blood Pressure.—The systolic blood-pressure readings taken after the initial period of work (Table III) show that a decided rise in the systolic pressure accompanies all muscular activity.[2]

A comparison of the decreases in this pressure after each of the respective recuperative procedures shows that blood pressure is not a factor in either facilitating or inhibiting the recovery process during the five-minute recuperation period. The average differences between the systolic pressures before work and after the respective recuperative procedure give the smallest differences to massage and the hot shower, twelve and seventeen millimeters respectively. The cold shower involves the highest average difference with thirty, standing position twenty-nine, sitting position twenty-four, and reclined position twenty. The average differences between the systolic pressures after work and after the respective recuperative procedures further substantiates the above conclusion. The largest differences involve the hot shower and massage, sixty-three

and fifty millimeters respectively. The smallest difference being that of the cold shower with thirty-one. Next in line are standing position thirty-four, sitting position thirty-seven, and reclining position forty-two. From the evidence presented it may be concluded that a rise in systolic pressure accompanies all initial work periods, and that no correlation exists between a rise or fall in blood pressure and the amount of work accomplished after the recuperative procedure.

Body Temperature.—An increase in body temperature occurs after all muscular activity in all individuals. Bainbridge[2] has shown that it is less in the case of trained than untrained men. From the data obtained in this experiment it is evident that each subject showed an increase of from 1 to 2 degrees Fahrenheit on all occasions after the initial work period. The readings taken just before the conclusion of the five-minute rest pause, during which the respective recuperative procedures were employed, show a decrease back to normal with the exception of the hot shower (Table IV) which produces increases of 2.0 and 3.2 degrees in 2 subjects. Massage involves maximum decrease in temperature with the following differences existing between the reading before work and after the respective recuperative procedure for 6 tests: .1, .1, .2, .2, .0, .0. In 2 instances then, the temperature returned to normal, and in 4 instances it was a fraction higher. The cold shower and reclined position, while not showing as pronounced a reduction show similar results. Since the amount of work done after the hot shower was decidedly less than after the remaining five recuperative processes (Tables I and II), it is to be concluded that a correlation seems to exist between a lowering of body temperature back to normal and maximum performance. A slight increase in body temperature is a necessary result of all muscular activity, but a continued increase by means of a hot shower is detrimental to subsequent performance.

Metabolism.—All trustworthy studies of metabolism have shown that oxidative processes, as estimated from the elimination of carbon dioxide and the absorption of oxygen, are considerably decreased by the application of heat to the body.[20] On the other hand, they are considerably increased by the application of cold.[20] The waste elements tending to stagnate in the various organs and tissues during fatigue[2] are carried into the circulation, then to the lungs where they are saturated with oxygen, and carried back into the internal circulation to be used by the tissues and organs to meet any increase in metabolism.[13] This explains, in part, the difference between the recuperative value of the hot and cold shower (Tables I and II). Massage increases the metabolic rate by mechanically forcing the lymph from the spaces[4] into the vessels[4]; and at the same time the circulation of the blood through the arteries and capillaries of the muscles is accelerated so that the absorption by the blood of the waste products produced during the initial work period is increased, and the

nutrition of all parts concerned is improved. The reclined position as opposed to the standing and sitting positions makes for complete relaxation, and conservation of body energy, thereby allowing the organs of the internal circulation an opportunity to concentrate fully upon ridding the tissues of the waste materials.

Blood Composition.—Even though no objective data were collected on the changes occurring in the composition of the blood during the administration of the respective recuperative procedures, some work has been done in the past noting the direct effect of hot and cold applications on the composition of blood. After the application of a cold shower to the entire surface of the body, there is observed, not only an increase in the number of leukocytes in a specimen of blood taken from either the tip of the finger or the lobe of the ear,[26] but also a considerable increase in the number of red corpuscles. It follows that there is also a corresponding increase in the percentage of haemoglobin in the blood,[7] which aids in throwing off the fatigue substances which have accumulated during the initial work period. This accounts, in part, for the greater output after a cold shower. A hot shower, however, reacts in a different manner. Although there is an increase in the number of leukocytes, there is a reduction in the number of red corpuscles.[26] This makes it possible that the haemoglobin content of the blood is so reduced that the fatigue products resulting from the initial work period cannot be carried to the lungs to be saturated with oxygen and are left flooding the tissues. Consequently, after spending two minutes of the rest pause under the hot shower, the subject comes to the second period of work with the fatigue products from the initial period of work still in his system. This accounts, at least in part, for the small amount of work which he accomplishes during the second period.

Circulation.—The effects of the respective recuperative procedures on the circulation of the blood are marked. The hot shower produces a dilatation of the superficial arteries.[16] The cutaneous vessels become dilated to such an extent that a large amount of blood is withdrawn from the internal circulation of the muscles, thereby decreasing the quantity of blood available for disposing of the fatigue products produced during the initial work period. The cold shower, while causing contraction of the cutaneous vessels, induces a dilatation of the vessels of the muscles.[26] The increased amount of blood brought to the muscles not only accelerates the disposal of the waste products produced during the initial period of work, but gives rise to increased production of heat in the tissues.[26] Hence, after the cold shower, the subject comes to the second period of work not only relieved of the fatigue products, but with augmented resistance of the muscles to fatigue. Massage produces significant changes upon the general circulation which probably account, for the most part, for its superiority in production during the second work period. By initially light

and gradually firmer friction of the surface, the venous blood and lymph are forced on through their respective vessels, and in this way the circulation is increased, as also that of the venous and lymphatic trunks lying in the deeper tissues.[26] Further kneading forces the lymph from the spaces into the vessels where it is prevented from flowing backward by valves.[4] At the same time the circulation of the blood, through the arteries and capillaries of the muscles, is accelerated, thereby increasing the absorption of the waste products produced in the initial work period. The nutrition of the parts is also improved; the blood flows into the parts with greater force and rapidity, increasing the velocity of the circulation through the part under treatment. In brief, during massage, the flow of blood is increased throughout, thus increasing the absorption of waste and providing a plentiful supply of nutritive material for building up again the store of energy depleted in the initial work period.

SUMMARY

1. Massage, used as a recuperative measure during a rest pause after an initial work period, makes for greater efficiency in muscular work during a second work period than a cold shower, hot shower, sitting position, standing position, or reclined position.

2. The cold shower ranks second in the order of recuperative efficiency, while the hot shower seems to be detrimental to performance.

3. The reclined position while not as effective as the cold shower holds a slight advantage over the sitting and standing positions.

4. Blood pressure is not a factor in the determination of the superiority of one recuperative procedure over another.

5. The differences in recuperative efficiency of the respective procedures are closely correlated with body temperature, blood circulation, blood composition, and metabolic rate.

6. A hot shower increases body temperature, while a cold shower, massage, sitting, standing, or reclined position decrease it.

7. Blood pressure increase accompanies all initial work periods.

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BIBLIOGRAPHY

1. Bainbridge, F. A. *The Essentials of Physiology*. New York: Longmans, Green and Company, 1916.

2. Bainbridge, F. A. *The Physiology of Muscular Exercise.* New York: Longmans, Green and Company, 1923.
3. Brunton, Sir Thomas Lauder. *Experimental Investigation of the Action of Medicines, Part I, Circulation.* London: J. and A. Churchill, 1875.
4. Gray, C. E., and Kimber, D. C. *Textbook of Anatomy and Physiology.* New York: Macmillan Company, 1926.
5. Gilbreth, Frank. *Fatigue Study.* New York: Macmillan Company, 1919.
6. Hastings, A. B. *The Physiology of Fatigue,* Public Health Bulletin No. 117, 1921.
7. Hastings, A. B. *The Physiology of Fatigue,* United States Public Health Service, 1925.
8. Hill, A. V. *The Recovery-Process After Muscular Experience in Man, The Harvard Lectures,* 60–78. Philadelphia: J. B. Lippincott Co., 1926.
9. Hill, A. V. *Muscular Activity.* Baltimore: The Williams and Wilkins Co., 1926.
10. Hill, A. V. "Scientific Study of Athletics," *Sci. American,* CXXXIV (April, 1926).
11. Hill, A. V. *Living Machinery.* New York: Harcourt, Brace and Company, 1927.
12. Hill, A. V. *Muscular Movement in Man.* New York: McGraw-Hill Book Company, 1927.
13. Hill, A. V. *The Rôle of Oxidation on Maintaining the Dynamic Equilibria of Life.* Milford, H., Oxford University Press, 1929.
14. "A Continuously Variable Speed Polygraph with a Telechronic Time Marker." *Journal General Psychology,* VI: 2 (April, 1932), 489–492.
15. Lee, F. S. "The Nature of Fatigue," *Pop. Science Mo.,* LXXVI (1910), 182–195.
16. Lee, F. S., and Scott, E. L. *Effects of Temperature and Humidity,* Studies in Phys. New York: Dept. of Phys., Columbia Univ., 1917.
17. Loveday, J. *An Experiment with Rest Pauses,* Report of The Industrial Fatigue Research Board No. 10.
18. Maggiora, A. "Les Lois de la Fatigue Etudiées Dans Les Muscles de l'Homme," *Archives Italiennes de Biologie,* XIII (1890).
19. Martin, E. G., and Weymoth, F. E. *Elements of Physiology.* Philadelphia: Lea and Febiger, 1928.
20. Mosso U. "Speed of Elimination of the Products of Fatigue and their Influence on the Contraction of Muscles," *Archives Italiennes de Biologie,* XCVII, 409–460.
21. Naumann, A. *Lehr Und Handbuch der Thermochemie,* Braunshweig Vieweg and Sohn, 1882.
22. Scott, E. L. "The Present Status of our Knowledge of Fatigue Products," *Public Health Reports,* XXXIII: 17, (April 26, 1918).
23. Steiglitz, Julius, *The Body as a Chemical Engine.* New York: The Chemical Foundation Inc., 1928.
24. Vernon, H. M. *The Influence of Hours of Work and of Ventilation on the Output in Tin-plate Manufacture,* Report of Industrial Research Board, No. 1.
25. Wallrich, L. A., and Dawson, P. M. *The Effect of Short Spells of Rest on Physical Efficiency as Measured by a Bicycle Ergometer.*
26. Winternitz, W. *A System of Physiologic Therapeutics,* Chapters I, II, III, Philadelphia: P. Blakiston's Son & Co., 1902.

Physical Education Knowledge Tests

Developed by the Department of Physical Education for Women, University of Minnesota

By Catherine Snell
Committee Chairman

THE KNOWLEDGE tests presented here were compiled and tested for reliability and validity by the Department of Physical Education for Women at the University of Minnesota in the spring of 1932, and revised three times thereafter. They are used as pretests for classifying students on entering the University and as post-tests for grading at the end of the term. The scores made on the knowledge tests are in most cases combined with scores made on practical tests in the same field and used as the basis of classification. The tests were made for ten different activities, namely: field hockey, soccer, basketball, baseball, volleyball, tennis, archery, golf, horseback riding, and fundamentals; and for hygiene.

The Department of Physical Education for Women of the University of Minnesota is indebted to Dr. Harl R. Douglass and Dr. Alvin C. Eurich and the Department of Educational Research for their help and guidance in making the tests.

MAIN STEPS IN PROCEDURE

Seventy questions were in the original set-up for each activity and 180 questions in the hygiene test.

After the tests were given twice to some 800 people, the number of questions was reduced from 70 to 45, for each of the activities and from 180 to 85 in hygiene. Questions found to be ambiguous and those which no one answered correctly or everyone answered correctly were taken out of the tests.

The formula used in correcting the answers was: "number right minus number wrong divided by N minus 1." N is the number of possible responses for each item and was five for these questions. Simply stated the formula was right minus $\frac{\text{wrong}}{4}$.

Expert opinion was the criterion used as the basis for establishing validity.

The correlation of chance halves odd numbered items vs. even numbered items, of each examination, was computed to give the reliability coefficient for half the examination. The "Spearman-Brown Prophecy

Formula" was used to find the reliability coefficient of the whole examination.

The following table shows the reliability coefficients for the original seventy questions and the revised sets of forty-five.

	70 questions			*70 vs. 45*			*45 questions*		
	n.	*r.*	*P.E.*	*n.*	*r.*	*P.E.*	*n.*	*r.*	*P.E.*
Archery	260	.6425	±.0634	91	.8647	±.0181	91	.7305	±.0897
Baseball	139	.8445	±.0470	55	.6774	±.0492	57	.8556	±.0683
Basketball	70	.8827	±.0514	46	.9381	±.0117	46	.6693	±.1441
Fundamentals	60	.8121	±.0840	99	.9679	±.0043	98	.5597	±.1003
Golf	214	.6264	±.0715	51	.9387	±.0111	51	.7015	±.1284
Hockey	85	.9066	±.0377				18	.9275	±.0642
Riding	34	.6268	±.1793	10	.9349	±.0269	10	.5107	±.3739
Soccer	62	.8376	±.0731	20	.8378	±.0444	20	.8565	±.1155
Tennis	514	.6574	±.0440	103	.9014	±.0109	102	.6551	±.0991
Volleyball	71	.8261	±.0724	10	.9853	±.0062	10	.8453	±.1746
Hygiene	98	.8786	±.0448	155	.8943	±.0109			
				(85 questions)					

The knowledge tests constituted one of a group of four tests. These tests were: knowledge, posture, attitude, and motor ability. During the years 1932–34 these four tests were used at the University of Minnesota in an experiment conducted to measure the result of physical education as taught by the Department of Physical Education for Women. The experiment was conducted by Miss Elizabeth Graybeal, a Research Fellow, under the direction of the Committee on Educational Research with Dr. Harl R. Douglass directly in charge of the experiment.

The tests for hygiene, fundamentals, archery, and hockey are given in full below. The remaining seven tests will be printed in a later issue.

FUNDAMENTALS

Directions.—After each statement there are five words or groups of words in parentheses each preceded by a letter. You are to write in the space indicated on answer sheet the letter of the *one* word or group of words that makes the truest or best statement. If a wrong letter is given as well as the right one in any given statement, no credit will be given for that statement. If you do not know the correct statement, do *not* guess.

1. In climbing a rope (*a.* rope is held by hands only; *b.* rope is held by hands and knees only; *c.* rope is held by legs only; *d.* rope is held by hands and feet; *e.* rope is held between hands, knees, and crossed feet).

2. Greater accuracy in catching can be secured by (*a.* reaching out to side with right hand to grasp ball; *b.* reaching to side with left hand; *c.* putting body to left of moving object, reaching to right with both hands; *d.* putting body to right of moving object, reaching to left with both hands; *e.* putting body in direct line of moving object, reaching forward with both hands).

3. To gain maximum height in vaulting over an object, approach with (*a.* long run and long steps; *b.* short run, light bounding steps; *c.* no run at all; *d.* uneven stride; *e.* long run, short steps).

4. To prevent dizziness in climbing a ladder, one should (*a.* look up; *b.* look down; *c.* close the eyes; *d.* keep eyes on stationary object on ground; *e.* climb with alternate arm and leg).

5. An important principle of catching is to (*a.* keep the eyes on the ball until it is resting securely in the hands; *b.* watch the person who threw the ball; *c.*

watch the person to whom the ball is thrown; *d.* keep the arms rigid; *e.* keep hands stiff until impact, then relax).

6. In jumping for height one should get a spring by (*a.* flexing ankles, knees, and hips; *b.* flexing ankles, and keeping other parts of body straight; *c.* bending forward at the waist and keeping knees straight; *d.* flexing knees and keeping other parts of the body straight; *e.* flexing hips and ankles, and keeping knees straight).

7. Throwing a basketball with one hand differs from throwing a baseball in that in the former (*a.* weight is transferred from the right to the left foot; *b.* the object is held in the curve of the wrist; *c.* there is a follow through of the entire body; *d.* the release is at 45° angle; *e.* the elbow is bent).

8. An object is tossed instead of thrown when (*a.* greater distance is required; *b.* greater force is required; *c.* an object is to be propelled through the air for a short distance for accuracy; *d.* the object is small and greater distance is desired; *e.* the object is to be propelled through the air for the greatest distance with the least effort).

9. When losing one's balance when landing from a jump one should (*a.* relax and fall forward; *b.* lean backward and put a stiff arm out to prevent fall; *c.* lean sideways; *d.* stiffen the hip and raise the arms for balance; *e.* relax the hip and keep ankles stiff).

10. The racing start and climbing stairs are governed by the principle that (*a.* the hip muscles should do the work rather than those of the back; *b.* the back muscles should do the work rather than those of the legs; *c.* the back should be relaxed to prevent strain; *d.* the abdominal muscles should do the work rather than those of the back; *e.* the hip muscles should do the work in addition to those of the legs).

11. Ease in catching is gained and injury to fingers or body is prevented by (*a.* keeping eye on the ball; *b.* transferring the body weight; *c.* "giving" of arms and body; *d.* keeping eyes on hands; *e.* "giving" of hands and keeping elbows straight).

12. "Fanning" a ball can be prevented by (*a.* transferring weight; *b.* using a longer club; *c.* standing farther away; *d.* standing closer; *e.* keeping eye on ball).

13. A one-footed take-off should be used for (*a.* somersault; *b.* playing leap frog; *c.* a straddle vault when approaching an obstacle from the front; *d.* a high jump; *e.* a jump for an object directly overhead).

14. More force is obtained in throwing by (*a.* keeping the eye on the target; *b.* finishing with the weight on the right foot; *c.* keeping the weight evenly distributed over both feet; *d.* swinging the arm backward for accumulating momentum; *e.* keeping the weight evenly distributed).

15. In catching a heavy object the following combination of factors is most essential (*a.* "give" with arms, back vertical, transfer of weight in direction of flight of object; *b.* "give" with the body, arms straight, back vertical; *c.* "give" with the arms, "give" with the body, transfer of weight in direction of flight of object; *d.* "give" with the arms, "give" with the body, transfer of weight toward the moving object; *e.* "give" with the body, eye on person throwing the object, transfer of weight in direction of flight of the object).

16. Right-handed people when tossing should stand (*a.* facing target, feet together or left foot forward; *b.* left side to target, feet astride; *c.* facing target, right foot forward; *d.* right side to target, right foot forward; *e.* right side to target, feet astride).

17. In pushing a large heavy object (e.g., piano) one can secure the greatest mechanical advantage with the least possibility of strain by (*a.* standing as near as possible to the object, facing it, and applying arm strength as near the top of the object as possible; *b.* standing sideward and close to the object, flexing hips and knees and putting shoulder against object, applying body weight as near the center

of gravity as possible; *c.* standing sideward and close to the object, flexing hips and knees and, putting shoulders against object, applying body weight as low down as possible; *d.* pushing with back to object, using muscles of legs; *e.* facing object, grasping sides and pulling toward self).

18. To prevent injury to the back in lifting a carrier of wood, one should (*a.* bend the trunk forward from the hips; *b.* incline the body sideward; *c.* incline the body backward; *d.* relax the back, keeping knees straight; *e.* bend the knees, keeping back straight).

19. In making a quick dodge around an obstacle (*a.* the head leads; *b.* the feet lead; *c.* the arms lead; *d.* the shoulders lead; *e.* the hips lead).

20. A sprint is a type of run done for the purpose of (*a.* covering a short distance at the greatest speed possible; *b.* warming up muscles preparatory to a race; *c.* testing endurance on a long distance; *d.* covering a long distance for speed; *e.* developing endurance in preparation for long distance runs).

21. If a club feels heavy in the hands one can adjust the weight so as to make the swing easier by (*a.* grasping the club with both hands nearer the end; *b.* separating hands about six inches on club; *c.* holding the bat so the trade mark is up; *d.* taping handle; *e.* grasping club with hands together three to seven inches from end).

22. To catch a baseball coming head height, one should hold the hands (*a.* with heels of hands together, fingers pointing upward; *b.* with little fingers together, fingers pointing downward; *c.* thumbs together, fingers pointing upward; *d.* with fingers pointing toward the ball; *e.* with palms facing, fingers pointing toward the ball).

23. A "shack" is the name for a (*a.* relaxed landing from a vault; *b.* method of starting a race; *c.* relaxed run; *d.* type of jump; *e.* piece of track equipment).

24. To secure the best leverage a right-handed person should grip a club (*a.* with the little finger of the right hand next to the forefinger of the left; *b.* with the little finger of the left hand next to the forefinger of the right hand; *c.* with the right hand below the left and about five inches apart; *d.* with both hands halfway up the club; *e.* with the right hand above the left and about five inches apart).

25. One should look up when climbing a ladder (*a.* in order not to become fatigued; *b.* to keep the body weight over the center of support; *c.* in order that many objects will not divert the attention; *d.* in order that primary fear of falling will not affect you; *e.* to eliminate body sway).

26. In using a window pole to push open a window that is difficult to open, one should stand (*a.* six inches away from the window; *b.* eighteen inches away from the window; *c.* two feet away from the window; *d.* five feet away from the window; *e.* as far out from the window as possible).

27. The underlying principle in the backward swing in golf, the body whirl in discus throw, the backward swing in tennis drive is (*a.* the longer the preliminary back swing the greater the distance secured; *b.* the longer the preliminary back swing the more accuracy secured; *c.* the shorter the preliminary back swing the greater distance secured; *d.* the longer the lever arm the greater the accuracy; *e.* the greater the transfer of weight the greater the accuracy).

28. More distance is gained in throwing by (*a.* keeping the eye on the ball; *b.* releasing the ball at a 45° angle upward from horizontal; *c.* releasing the ball at a 90° angle upward from horizontal; *d.* keeping the eye on the target; *e.* releasing the ball at a 45° angle downward from horizontal).

29. More force is put into a thrown ball if (*a.* the eye is kept on the target; *b.* the ball is grasped in the whole hand; *c.* the body is twisted to the right at the start of the throw; *d.* the shoulders are kept facing forward; *e.* the weight is kept evenly distributed between both feet).

30. In striking with an implement of correct size the hands should be (*a.* three inches apart at the end of the club; *b.* together at the end of the club; *c.* three inches apart and several inches from the end of club; *d.* together and eight inches from end of club; *e.* together in middle of club).

31. The following principles apply in baseball, golf, tennis: (*a.* follow through, "give," hip lead; *b.* transfer of weight, "give," side in direction of flight of ball; *c.* grip near end, transfer of weight, "give"; *d.* transfer of weight, eye on ball, side in direction of flight of the ball; *e.* hip lead, grip near end of club, horizontal swing).

32. A two-footed take-off should be used in the following situation: (*a.* approaching a railing about three feet high from the side; *b.* playing leap frog; *c.* crossing a brook; *d.* jumping for height over a standard; *e.* jumping a series of hurdles).

33. In jumping for an object above the head, one should begin the jump with (*a.* both hands above the head; *b.* one hand above the head, hips, knees and ankles flexed; *c.* both hands at the sides, hips straight; *d.* straight knees, hips straight; *e.* both hands at the sides, hips, knees and ankles flexed).

34. If a club feels too heavy to swing, one should (*a.* move the hands farther apart; *b.* move the hands down to lengthen the weight arm; *c.* move both up to shorten the weight arm; *d.* overlap the grip; *e.* omit the backward or preparatory swing).

35. Running to first base or crossing the line at the end of a race should be governed by the principle that (*a.* the weight should be carried over the base of support; *b.* a quick stop is most easily made if the weight is kept back; *c.* the base or finish line is overrun in order to decrease the running time; *d.* a rapidly moving body stops with greater effort than one moving slowly; *e.* a slow start or stop causes cramped muscles).

36. For balance on a moving vehicle one should (*a.* face in direction vehicle is moving, feet together; *b.* face the direction in which the vehicle is moving, feet astride fifteen to eighteen inches; *c.* face with side in direction vehicle is moving feet astride fifteen to eighteen inches and parallel; *d.* face with side in direction vehicle is moving, feet together; *e.* face with side in direction vehicle is moving, feet astride fifteen to eighteen inches and one slightly ahead of other).

37. When stopping a ball rolling on the ground the (*a.* little fingers of both hands are parallel and pointing downward; *b.* thumbs of both hands are parallel and pointing upward; *c.* heels of hands are together, fingers pointing forward; *d.* palms are facing, fingers pointing forward; *e.* heels of hands are together, fingers pointing downward).

38. Accuracy at short range is secured best by (*a.* overhand throw; *b.* underhand throw; *c.* side-arm throw; *d.* overhead throw; *e.* chest throw).

39. To gain distance when jumping one should (*a.* approach with a slow run; *b.* keep the weight over the rear leg; *c.* bend the arms and reach backward; *d.* take a one-footed take-off; *e.* take a two-footed take-off).

40. More distance is gained in striking when (*a.* object is hit at 90° angle; *b.* body is facing in the direction the object is to go; *c.* the leverage is increased to the maximum; *d.* the hands are separated twelve inches on the club; *e.* the hands are together in the middle of the club).

41. In order to secure the greatest results of energy in lifting (*a.* apply force at right angles, use leg muscles, by bending hips and knees, keep back vertical; *b.* apply force at 45° angle, use leg muscles, curve the back and exert the force with the arms; *c.* apply force at right angles, use leg muscles, curve the back and exert force with arms; *d.* keep back vertical, bend hips and knees, apply force at 45° angle; *e.* use the leg muscles by bending hips and knees, curve the back and apply force at right angles).

42. If a batter (in baseball) wishes to send the ball into left field, he should

(*a.* hit the ball squarely as it crosses the plate; *b.* hit the ball after it has crossed the plate; *c.* turn the body so the left shoulder is toward first base; *d.* face the pitcher and hit the ball after it crosses the plate; *e.* hit the ball before it crosses the plate).

43. To prevent jar in landing one should (*a.* land on whole foot and bend the hips and knees; *b.* land on balls of feet and relax ankles, knees, and hips and fall forward if necessary; *c.* stiffen the ankles and bend hips and knees; *d.* land on whole foot, keeping upper trunk straight; *e.* land on balls of feet and shift weight to heels to avoid falling forward).

44. The following principle is applicable to striking, tossing, and throwing: (*a.* the weight is transferred from the right to the left foot; *b.* the eye is kept on the ball; *c.* throughout the movement the left side points in the direction the object is to go; *d.* the eye is kept on the target; *e.* the body is facing in the direction the object is to go).

45. To move a very heavy unwieldy object through space it is easier to (*a.* throw it overhand with one hand; *b.* throw it with single side-arm pass; *c.* throw it overhand with two hands; *d.* throw it with chest pass; *e.* toss it).

46. In any skill involving either throwing or striking for distance the following combination of factors is most essential: (*a.* follow through, transfer weight, eye on the target; *b.* eye on the target, release at 45° angle, transfer weight; *c.* release at 45° angle, transfer weight, follow through; *d.* finish with arm or implement pointing in direction of throw or strike, keep eye on the target, follow through forcefully; *e.* release at 45° angle, eye on target, finish in direction of throw or strike).

47. One can best add body weight to the stroke if the ball is hit while (*a.* well ahead of the body; *b.* even with the body; *c.* slightly behind the center body line; *d.* slightly ahead of the body; *e.* well behind the center body line).

48. Straightening the arms during striking has the same effect on the flight of the ball as does (*a.* the transference of weight; *b.* a good follow through; *c.* keeping the eye on the ball; *d.* holding the hands at the end of the club; *e.* shortening the grip on the handle of the club).

49. The correct position of the body in running is (*a.* leaning forward with weight on the heels to secure balance; *b.* erect with weight evenly distributed; *c.* bending forward from the waist to increase momentum; *d.* leaning forward which necessitates a forward step for balance; *e.* any natural and relaxed position).

50. Greater speed in throwing can be secured by (*a.* taking a "wind-up" before each throw; *b.* omitting the preliminary swing; *c.* omitting the flick of the wrists; *d.* holding the ball in the full fist; *e.* making the catch the preliminary swing for the throw).

ARCHERY

Directions.—After each statement there are five words or groups of words in parentheses each preceded by a letter. You are to write in the space indicated on answer sheet the letter of the *one* word or group of words that makes the truest or best statement. If a wrong letter is given as well as the right one in any given statement, no credit will be given for that statement. If you do not know the correct statement, do *not* guess. Print the answers in capital letters. Do not write on the question sheet. Place the number of the question sheet on each answer sheet.

1. After loosing the arrow it is important to (*a.* watch the flight of the arrow; *b.* hold the shooting position for one to one-third seconds; *c.* nock another arrow immediately; *d.* relax the position before the next shot; *e.* refrain from stepping over the shooting line).

2. In shooting, the right-handed archer should sight with (*a.* the right eye,

left eye closed; *b*. both eyes; *c*. the left eye, right eye closed; *d*. the right eye, left eye open; *e*. the left eye, right eye open).

3. One aspect of caring for equipment at the end of a class period is (*a*. standing the bows upright on the floor; *b*. hanging the bow and leaving it strung; *c*. wiping bows and arrows clean; *d*. neglecting to salvage an arrow whose feathers are gone; *e*. taking care not to touch feathers).

4. The fingers which are on the bow string during the draw are (*a*. all the fingers of the right hand; *b*. the first finger and thumb of the right hand; *c*. the first three of the right hand; *d*. the first two and the thumb; *e*. the first three and the thumb).

5. The term "quiver" refers to (*a*. the wavering of the arm when the draw is held too long; *b*. the deviation of the flight of the arrow as caused by the wind; *c*. the jerky release of the bow string; *d*. a utensil for holding arrows; *e*. the nervousness of the archer).

6. As you move farther away from the target your aim should (*a*. be lowered; *b*. be raised; *c*. stay the same; *d*. be moved to the left; *e*. be moved to the right).

7. A possible cause of injury to an archer is (*a*. bringing string only halfway to the face; *b*. bending left elbow; *c*. arrow rebounding from target; *d*. drawing the string beyond the length of the arrow; *e*. releasing the right hand).

8. The best weight bow for outdoor use for the average beginner is (*a*. 16–24 lbs; *b*. 24–32 lbs; *c*. 32–40 lbs; *d*. 8–16 lbs; *e*. 1–8 lbs).

9. When the bow arm is in position for shooting, the arrow is at the (*a*. left of the bow, with the cock feather to the right; *b*. right of the bow, with the cock feather to the right; *c*. right of the bow with the cock feather to the left; *d*. left of the bow with the cock feather on top).

10. If the arrow falls off the bow hand it is generally due to (*a*. cross wind; *b*. not holding arrow with left index finger; *c*. holding arrow too loosely with right hand; *d*. holding arrow too tightly with right hand; *e*. tipping bow to left).

11. The object at which the archer aims should be in vertical alignment with the (*a*. gold of the target; *b*. right side of the target; *c*. left side of the target; *d*. bottom edge of the target; *e*. top edge of the target).

12. The most common error sending an arrow too low is (*a*. following arrow with right hand; *b*. jerking loosing hand away from face; *c*. hunching the left shoulder; *d*. dropping bow hand; *e*. watching the flight of the arrow).

13. Six arrows are shot with the following results: 1 arrow hits the gold and drops off, 1 arrow hits the black and drops off, 1 arrow hits in the petticoat, 3 in the blue. The complete score is (*a*. 9,7,7,7,3,1 - 6 - 24; *b*. 9,5,5,5,3,0 - 5 - 27; *c*. 5,5,5,5,5,1 - 6 - 26; *d*. 5,5,5,5,5,0 - 5 - 25; *e*. 7,7,7,5,5,0 - 5 - 31).

14. An end is shot with the following results: 1 in gold, 2 in blue, 1 in petticoat, 2 in red. The complete record is (*a*. 7,7,3,3,1,0 - 5 - 21; *b*. 9,7,7,5,5,0 - 5 - 33; *c*. 9,7,7,5,5,1 - 6 - 34; *d*. 9,5,5,3,3,1 - 6 - 26; *e*. 9,5,5,3,3,0 - 5 - 25).

15. The left wrist in shooting is (*a*. flexed toward palm; *b*. hyperextended; *c*. straight; *d*. flexed to little finger side; *e*. flexed to thumb side).

16. Arrows which are made of one piece of wood are called (*a*. self arrows; *b*. footed arrows; *c*. plain arrows; *d*. hunting arrows; *e*. target arrows).

17. To prevent breaking the bow one should never (*a*. shoot on a range where there are rocks and stones; *b*. hang the bow up unstrung; *c*. shoot with too long an arrow; *d*. shoot in wet weather; *e*. draw the bowstring without an arrow on it).

18. The crest is the (*a*. coloring painted on the shaftment for identification; *b*. feather which differs in color from the other two; *c*. upper nock of the bow; *d*. three feathers on the arrow; *e*. shaftment).

19. An arrow cutting the black and white equally on the target is counted (*a*. one point; *b*. three points; *c*. two points; *d*. five points; *e*. no score, one more shot allowed).

20. The flat side of the bow is called the (*a.* belly; *b.* back; *c.* front; *d.* upper limb; *e.* lower limb).

21. The most common error sending an arrow high is (*a.* following the arrow with the right hand; *b.* jerking loosing hand away from face; *c.* hunching left shoulder; *d.* dropping bow hand; *e.* watching flight of arrow).

22. Two errors which send arrows to the left are (*a.* dropping the bow hand and jerking the loosing hand; *b.* jerking the loosing hand away from the face and following the arrow with the right hand; *c.* hunching the left shoulder and throwing bow arm to the left; *d.* watching the flight of the arrow and following the arrow with the right hand; *e.* hunching the left shoulder and jerking loosing hand away from face).

23. The serving is placed on the bowstring (*a.* opposite the handle; *b.* opposite the upper edge of the handle; *c.* opposite the lower edge of the handle; *d.* just below the loops; *e.* at the place the knot is tied).

24. The score of six arrows landing as follows—white 1, miss 1, gold 1, red 2, black 1,—would read (*a.* 6 hits, score 27; *b.* 9,7,7,3,1,0 - 5 - 27; *c.* 9,7,7,3,1,0 - 6 - 27; *d.* 9,9,5,3,1,0 - 5 - 27; *e.* 9,7,5,5,1,0 - 5 - 27).

25. The pull measured in pounds necessary to draw a bow the length of its arrow is called (*a.* pull; *b.* weight; *c.* force; *d.* strength; *e.* draw).

26. The best bowstrings are made of (*a.* hemp or flax; *b.* wire; *c.* hemp or rawhide; *d.* gut or rawhide; *e.* gut or flax).

27. During the draw the arrow should rest (*a.* on the thumb at the right of the bow; *b.* on the extended forefinger at the left of the bow; *c.* at the left of the bow between the first two joints of the forefinger; *d.* between the first and second fingers; *e.* on the wrist joint).

28. The object at which the archer aims is called the (*a.* target; *b.* gold; *c.* point of aim; *d.* ground; *e.* goal).

29. The arrow should be released by (*a.* pushing the arrow; *b.* relaxing the fingers; *c.* extension of the fingers; *d.* jerking the right hand off the string; *e.* relaxing the muscles of the right shoulder).

30. The upper and lower limbs of the bow differ in that the (*a.* upper limb is more curved; *b.* upper limb is less curved; *c.* upper limb is heavier; *d.* upper limb is lighter; *e.* upper limb is made of a different kind of wood).

31. Bruising the arm with bow string is due to (*a.* incomplete draw; *b.* bending left wrist; *c.* drawing back too close to arm; *d.* using too heavy a bow; *e.* hyper-extended elbow).

32. The grooves for the bow string on the upper and lower limbs of the bow are called the (*a.* notches; *b.* nocks; *c.* nicks; *d.* piles; *e.* string grooves).

33. The length of arrow used by an archer depends on (*a.* length of her arm and length of bow; *b.* weight of bow; *c.* distance from target; *d.* weight and length of bow; *e.* weight of bow and length of arm).

34. The cock feather is distinguished from the rest by the fact that it is always (*a.* at right angles to the nock; *b.* parallel to the nock; *c.* a different color from the others; *d.* a different shape from the others; *e.* set a little back of the others).

35. In aiming the sight is (*a.* along the shaft of the arrow; *b.* over the cock feather; *c.* over the pile of the arrow; *d.* to the right of the bow; *e.* between the bow and the bow string).

36. A bow with back and belly made of different wood is called a (*a.* spliced bow; *b.* backed bow; *c.* reinforced bow; *d.* pieced bow; *e.* self bow).

37. The distance from the center of the gold of the target to the ground should be (*a.* two feet; *b.* four feet; *c.* six feet; *d.* three feet; *e.* five feet).

38. Two errors which send arrows to the right are (*a.* hunching left shoulder and throwing the bow arm to the left; *b.* dropping bow hand and jerking the loosing hand away from the face; *c.* jerking the loosing hand away from face and

following arrow with the right hand; *d.* watching the flight of the arrow and following the arrow with the right hand; *e.* hunching the left shoulder and jerking the loosing hand away from the face).

39. The woods most commonly used for making arrows are (*a.* birch, hickory, Norway pine; *b.* Port Orford cedar, birch, hickory; *c.* birch, yew, Norway pine; *d.* Port Orford cedar, birch, Norway pine; *e.* birch, hickory, yew).

40. In bending or stringing a bow with the right hand on the handle (*a.* the tip of the bow should be in the arch of the left foot; *b.* pressure should be exerted with the fingers; *c.* the right hand is held in place while the string is drawn into place with the left hand; *d.* the left hand pulls the bow against the arch of the right foot; *e.* the upper limb of the bow is bent by pressure of the heel of the left hand).

41. When the bow is bent the distance between the bow and string at the handle should be (*a.* five to seven inches; *b.* six to ten inches; *c.* one to two feet; *d.* one to three inches; *e.* less than one inch).

42. The woods most commonly used in making bows are (*a.* hickory, birch, lemonwood; *b.* yew, lemonwood, osage orange; *c.* Norway pine, hickory, osage orange; *d.* yew, hickory, birch; *e.* Norway pine, yew, hickory).

43. The bow is grasped (*a.* by the thumb and forefinger of the left hand; *b.* by the left hand at the bottom of the handle; *c.* by the left hand at the top of the handle; *d.* by the left hand reaching around from the back of the bow; *e.* by the fingers (not thumb) of the left hand).

44. A Columbia round consists of (*a.* 6 arrows each at 60, 50, and 40 yards; *b.* 24 arrows each at 50, 40, and 30 yards; *c.* 48 arrows each at 50, 40, and 30 yards; *d.* 12 arrows each at 40, 30, and 20 yards; *e.* 24 arrows each at 40, 30, and 20 yards).

45. Shooting in damp weather will cause (*a.* feathers to come off arrow; *b.* bows to increase in weight; *c.* bowstrings to rot; *d.* colors on target face to run; *e.* piles to come off arrows).

HOCKEY

Directions.—After each statement there are five words or groups of words in parentheses each preceded by a letter. You are to write in the space indicated on answer sheet the letter of the *one* word or group of words that makes the truest or best statement. If a wrong letter is given as well as the right one in any given statement, no credit will be given for that statement. If you do not know the correct statement, do ***not*** guess.

1. A whistle is necessary before the players can take a (*a.* twenty-five-yard bully; *b.* corner; *c.* free hit; *d.* center bully; *e.* roll-in).

2. The right wing taking the corner on the side line made sticks; the decision is (*a.* corner for defending team; *b.* free hit for opposing team; *c.* free hit for attacking team; *d.* penalty corner for attacking team; *e.* penalty corner for defending team).

3. The attack sends the ball over the goal line not between the goal posts. The ball is put in play by a (*a.* center bully; *b.* penalty bully; *c.* twenty-five-yard bully; *d.* corner hit; *e.* roll-in).

4. The "defending team" refers to the team that (*a.* has possession of the ball; *b.* does not have possession of the ball; *c.* is nearer own goal; *d.* is nearer opponents' goal; *e.* has the lower score).

5. For any breach of the rules by the attacking team a (*a.* penalty bully is called; *b.* free hit is awarded the defending team; *c.* penalty corner is awarded the defense; *d.* bully is taken on the twenty-five-yard line; *e.* center bully is taken).

6. The foul known as "sticks" is called when one player (*a.* knocks another player's stick out of her hand; *b.* "locks" sticks with an opponent; *c.* strikes the ball so that it goes high in the air; *d.* raises her stick above shoulder height; *e.* holds the ball with her stick).

7. The left inside is marked by (*a.* opposing right inside; *b.* opposing left wing; *c.* right halfback on the same team; *d.* right fullback on the same team; *e.* opposing right fullback).

8. If you see what you think is a foul by your opponents you must (*a.* ask the umpire to stop the game; *b.* ask the captain to call "time out"; *c.* play on; *d.* ask the umpire for twenty-five-yard bully; *e.* let it go until you see whether your team loses by the play; if so, call "time out").

9. The ball passes over the side line off the sticks of two opponents. The umpire awards a (*a.* twenty-five-yard bully; *b.* center bully; *c.* free hit; *d.* corner; *e.* bully opposite the point where the ball crossed the line).

10. The penalty for offside is (*a.* penalty bully; *b.* roll-in; *c.* free hit; *d.* corner; *e.* penalty corner).

11. If the left wing runs outside the field, but manages to keep the ball in the field, the umpire should (*a.* call for a roll-in; *b.* give a free hit to opposing half; *c.* do nothing—let play go on; *d.* call for a bully at the spot where the left wing crossed the line; *e.* hold whistle to see who benefits).

12. When two players exchange places in order that they may fulfill their duties more efficiently it is known as (*a.* exchange; *b.* interchange; *c.* marking; *d.* guarding; *e.* rushing).

13. Strokes used particularly for defensive play are (*a.* dribble, scoop, left hand lunge; *b.* push pass, dribble, job; *c.* left hand lunge, right cut, job; *d.* push pass, left hand lunge, scoop; *e.* scoop, dribble, job).

14. A particular duty of the wing is to (*a.* take the center bullies; *b.* mark the opposing wing; *c.* mark the opposing halfback; *d.* keep the ball from crossing the side line; *e.* lead the defense).

15. If the ball is not motionless at the time of a free hit the umpire should award a (*a.* free hit to opponents; *b.* second free hit to the same player; *c.* bully; *d.* roll-in; *e.* corner).

16. On a center bully the ball is in general play (*a.* when the umpire blows her whistle; *b.* after the bully has begun; *c.* after the sticks have been hit the third time; *d.* after the ground has been hit the third time; *e.* when either center forward touches the ball after the sticks have been hit the third time).

17. Running between your opponent and the ball is a foul called (*a.* kicking; *b.* sticks; *c.* carrying on; *d.* obstruction; *e.* charging).

18. Close marking of the forwards is most vitally important (*a.* in the center of the field; *b.* inside the striking circle; *c.* on the center bully; *d.* near the opponents' twenty-five-yard line; *e.* between opponents' twenty-five-yard line and the center of the field).

19. In general the forwards' area of play is from (*a.* their own striking circle to opponents' striking circle; *b.* the center line to opponents' striking circle; *c.* their own twenty-five-yard line to opponents' goal line; *d.* their own goal line to opponents' striking circle; *e.* their own goal line to opponents' goal line).

20. When the forwards have reached their opponents' twenty-five-yard line they should try to (*a.* "center" the ball; *b.* dribble to the goal line; *c.* pass the ball to the wing; *d.* pass the ball back to their own halfback; *e.* shoot).

21. Strokes used particularly for offensive play are (*a.* scoop, dribble, push pass; *b.* scoop, dribble, left hand lunge; *c.* push pass, flick, right hand lunge; *d.* push pass, right cut, job; *e.* dribble, push pass, job).

22. On a legal roll-in the ball must hit the ground within (*a.* one yard of the point where it crossed the line; *b.* two yards of the point where it crossed the line; *c.* three yards of the point where it crossed the line; *d.* four yards of the point where it crossed the line; *e.* five yards of the point where it crossed the line).

23. If the ball, during play, is sent over the side line a (*a.* free hit is given the opponent; *b.* roll-in is awarded; *c.* bully is taken by insides; *d.* corner is called; *e.* penalty bully is awarded).

24. A corner is awarded when the (*a.* attack sends the ball over the goal line; *b.* defense intentionally sends the ball over the goal line; *c.* defense unintentionally sends the ball over the goal line; *d.* ball crosses the goal line off the sticks of two opponents; *e.* a defending player beyond the twenty-five-yard line unintentionally sends the ball over the goal line).

25. A player runs down the field carrying her stick higher than her shoulder but does not touch the ball. The umpire should (*a.* award a free hit to the opponents; *b.* call for a bully; *c.* allow play to continue; *d.* award a corner to opponents; *e.* call for a roll-in).

26. The goalkeeper, unlike other players, is allowed to (*a.* take hold of the ball and throw it; *b.* deliberately bat the ball; *c.* kick the ball; *d.* catch the ball, providing she drops it perpendicularly; *e.* put her foot on the ball to prevent players from hitting it).

27. It is most important for a team to try to pass the ball to the sides of the field (*a.* when in the center of the field; *b.* between the center line and their own twenty-five-yard line; *c.* between their own goal line and the twenty-five-yard line; *d.* when in their opponents' striking circle; *e.* between the twenty-five-yard line and their opponents' goal line).

28. In defending the goal from a ball coming from the left, the goalkeeper stands (*a.* in the left hand corner of the cage behind the line; *b.* near the left post and well out in front; *c.* in the center about two feet in front of the line; *d.* to the right and about eight or ten feet in front of the line; *e.* in the center and eight or ten feet in front of the line).

29. On a corner, penalty corner, or free hit, all players not hitting ball must (*a.* stand ten yards away; *b.* stand no nearer than five yards; *c.* stand outside striking circle; *d.* stand beyond twenty-five-yard line; *e.* stand at least one yard away).

30. The ball is hit by the center forward outside the striking circle and glances off the stick of the goalkeeper into the goal. The umpire awards a (*a.* goal; *b.* free hit; *c.* corner; *d.* penalty corner; *e.* twenty-five-yard bully).

31. A player is never offside if she (*a.* has two opponents between her and the goal; *b.* does not play the ball; *c.* is in her half of the field; *d.* does not shoot for a goal; *e.* has one opponent between her and the goal).

32. The ball is hit by the right inside outside the striking circle and it passes into the goal without being touched by another player. The umpire awards a (*a.* goal; *b.* free hit; *c.* corner; *d.* penalty corner; *e.* twenty-five-yard bully).

33. A foul made by laying back the blade of the stick and hitting the ball hard so that it shoots into the air is called (*a.* pushing; *b.* lifting; *c.* undercutting; *d.* scooping; *e.* driving).

34. The most common stroke used by a halfback who has been outdistanced and is recovering on the right of her forward is the (*a.* scoop; *b.* right hand lunge; *c.* left hand lunge; *d.* push pass; *e.* job).

35. A penalty corner is taken (*a.* by the defense on the spot where the foul occurred; *b.* by the attack from a point on the goal line not less than ten yards from the nearer goal post; *c.* by the attack from a point on the goal line within three yards of the corner where the ball went out; *d.* by the defense from a point on the goal line not less than ten yards from the nearer goal post; *e.* by the attack on the spot where the foul occurred).

36. The defense plays on (*a.* a parallel to center line; *b.* a fixed diagonal; *c.* a semi-circle; *d.* two lines parallel to center line; *e.* diagonal line which shifts with the play).

37. Fielding the ball with any part of the body so that it bounces into an advantageous position is a foul called (*a.* charging; *b.* pushing; *c.* undercutting; *d.* carrying on; *e.* obstruction).

38. The right halfback marks the (*a.* left inside; *b.* left wing; *c.* right wing; *d.* right inside; *e.* left halfback).

39. The red center forward pulls the ball between her feet on the center bully. The umpire's decision is (*a.* bully is retaken; *b.* free hit for the blue team; *c.* free hit for the red team; *d.* play continues; *e.* corner hit for blue team).

40. Players should be most careful about off-side (*a.* when they have rushed a shot and the goalkeeper has cleared; *b.* on a penalty corner; *c.* when near center field and the ball is in possession of our team; *d.* when near opponents' circle, ball being driven to center forward from the left wing well up the alley; *e.* when near midfield and ball is in possession of opponents).

41. On a penalty corner the left wing hits the ball to the center forward who shoots for goal without attempting to stop the ball. The umpire awards a (*a.* penalty corner to defending team; *b.* free hit for defense anywhere in circle; *c.* free hit to defending team on spot where center forward stood; *d.* free hit to attacking team on spot where center forward stood; *e.* twenty-five-yard bully).

42. If the fullback wishes to prevent her opponents from scoring, she must at all costs avoid (*a.* too close marking; *b.* being drawn outside circle; *c.* being drawn beyond twenty-five-yard area; *d.* hitting ball across the goal; *e.* interchange with other fullback).

43. Penalty bully is taken by (*a.* the two center forwards; *b.* the defense fullback and attacking forward; *c.* the defense who made the foul and the attacking center half; *d.* the defense who made the foul and anyone the attacking captain chooses; *e.* the two center halves).

44. When taking a free hit the player may not use the (*a.* drive; *b.* push pass; *c.* left hand lunge; *d.* scoop; *e.* right hand lunge).

45. The right wing is ahead of the ball when it is passed to her by the right inside. The goalkeeper and left fullback are between her and the goal. The umpire's decision is (*a.* legal play and game continues; *b.* roll-in awarded to opponents; *c.* free hit awarded opponents; *d.* corner awarded opponents; *e.* penalty corner awarded opponents).

HYGIENE

Directions.—After each statement there are five words or groups of words in parentheses each preceded by a letter. You are to write in the space indicated on answer sheet the letter of the *one* word or group of words that makes the truest or best statement. If a wrong letter is given as well as the right one in any given statement, no credit will be given for that statement. If you do not know the correct statement, do *not* guess.

1. The study of the structure of the body is called (*a.* hygiene; *b.* physiology; *c.* endocrinology; *d.* nutrition; *e.* anatomy).

2. The abdominal cavity contains the following organs (*a.* stomach and heart; *b.* kidneys and vagina; *c.* heart and lungs; *d.* uterus and intestines; *e.* pancreas and liver).

3. The bones that enclose the chest (thoracic cavity) are (*a.* ribs, pelvic bones, shoulder blades; *b.* vertebrae, collar bones, breastbone; *c.* pelvic bones, collar bones, shoulder blades; *d.* ribs, vertebrae, breastbone; *e.* breastbone, shoulder-blades, pelvic bones).

4. The bony structures enclosing the pelvic cavity are (*a.* vertebrae, collar bones; *b.* pelvic bones, ribs; *c.* pelvic bones, vertebrae; *d.* vertebrae, shoulder blades; *e.* pelvic bones, collar bones).

5. The jointed structure of the body makes for (*a.* rigidness; *b.* straighter posture; *c.* more flexibility and grace of movement; *d.* ease in standing; *e.* protection against fatigue).

6. Serous membranes line cavities and cover organs that are entirely shut off from communication with the atmosphere and have the function of (*a.* nervous

and mechanical protection; *b.* absorption and excretion; *c.* respiration and oxygen exchange; *d.* contracting and producing movement; *e.* protection and lessening friction).

7. The end organs of taste are found in the mucous membrane of (*a.* the oesophagus; *b.* the pharynx; *c.* the hard palate; *d.* the tongue; *e.* the nose).

8. The following are organs of the respiratory tract (*a.* trachea and larynx; *b.* pharynx and oesophagus; *c.* heart and aorta; *d.* uterus and lungs; *e.* liver and nose).

9. The scientific name for the voice box is (*a.* the pharynx; *b.* the oesophagus; *c.* the trachea; *d.* the diaphragm; *e.* the larynx).

10. The scientific term for windpipe is (*a.* trachea; *b.* pharynx; *c.* larynx; *d.* oesophagus; *e.* gullet).

11. The substance in blood that carries the oxygen is the (*a.* plasma of the venous blood; *b.* hemoglobin of the white cells; *c.* hemoglobin of the red cells; *d.* plasma of the arterial blood; *e.* lymph cells).

12. The chief organ between the two lungs is (*a.* the thymus; *b.* the heart; *c.* the thyroid gland; *d.* the kidney; *e.* the oesophagus).

13. The pancreatic duct opens into the (*a.* stomach; *b.* liver; *c.* oesophagus; *d.* large intestine; *e.* small intestine).

14. Fat is absorbed from the small intestine into the (*a.* lymphatic stream; *b.* arteries; *c.* capillaries of blood stream; *d.* veins; *e.* venous capillaries).

15. Pancreatic juice is the secretion from the (*a.* liver; *b.* stomach; *c.* adrenals; *d.* pancreas; *e.* salivary glands).

16. Most of the absorption of food from the digestive tract into the blood takes place in the (*a.* small intestine; *b.* stomach; *c.* large intestine; *d.* rectum; *e.* liver).

17. Gastric juice is the secretion from (*a.* the liver; *b.* the stomach; *c.* the adrenals; *d.* the pancreas; *e.* the salivary glands).

18. Saliva contains enzymes for the digestion of (*a.* carbohydrate only; *b.* protein only; *c.* carbohydrate and fat; *d.* protein, carbohydrate, and fat; *e.* fat only).

19. The kidney is an organ of the (*a.* alimentary system; *b.* urinary system; *c.* reproductive system; *d.* circulatory system; *e.* endocrine system).

20. The following are organs of the urinary system (*a.* kidneys and uterus; *b.* liver and bladder; *c.* bladder and ureter; *d.* rectum and ureter; *e.* urethra and vagina).

21. The following are organs of the female reproductive system (*a.* ovaries and Fallopian (uterine) tubes; *b.* uterus and bladder; *c.* urethra and vagina; *d.* uterus and kidney; *e.* Fallopian tubes and ureters).

22. The following process occurs in the uterus (*a.* fertilization; *b.* ovulation; *c.* implantation; *d.* coitus; *e.* peristalsis).

23. Organs of the male reproductive system include (*a.* uterus and penis; *b.* testes and bladder; *c.* vasdeferens and vagina; *d.* penis and rectus; *e.* vasdeferens and testes).

24. The following are glands of internal secretion (*a.* adrenals and thymus; *b.* liver and pancreas; *c.* thyroid and uterus; *d.* gastric glands; *e.* salivary glands).

25. The prostate gland is an organ of the (*a.* male urinary system; *b.* female reproductive system; *c.* alimentary tract; *d.* male reproductive system; *e.* female urinary system).

26. The organs that lie above the diaphragm are (*a.* heart and lungs; *b.* liver and stomach; *c.* liver and lungs; *d.* lungs and stomach; *e.* heart and liver).

27. The adrenal (suprarenal) gland lies just above the kidney and secretes (*a.* insulin; *b.* urine; *c.* adrenalin; *d.* saliva; *e.* bile).

28. Regularity in exercise makes one feel better because it (*a.* causes fatigue;

b. increases the circulation of the blood and lymph; *c.* increases fatty deposits; *d.* relieves tired feet; *e.* slows the heart rate).

29. Carbon dioxide is removed from the body tissues that have been at work by (*a.* the arteries; *b.* the nerves; *c.* the red blood corpuscles; *d.* hemoglobin; *e.* the veins and lymph vessels).

30. During exercise there is a dilation of the blood vessels in the (*a.* muscles and skin; *b.* muscles and brain; *c.* muscles and stomach; *d.* skin and intestines; *e.* uterus and vagina).

31. During exercise there is (*a.* a decreased heart rate and a rapid pulse rate; *b.* an increased heart and respiratory rate; *c.* a decreased respiratory rate and decreased heart rate; *d.* an increased respiratory rate and decreased heart rate; *e.* increased pulse with decreased respiratory rate).

32. Exercise "clears the brain" after a long seige of study because it (*a.* raises the temperature; *b.* helps keep an individual thin; *c.* increases muscle tone; *d.* increases the flow of lymph and circulation of the blood; *e.* makes an individual tired).

33. A food that is mainly starch is (*a.* meat; *b.* potatoes; *c.* butter; *d.* lettuce; *e.* milk).

34. Some foods having the highest caloric value are (*a.* butter and lettuce; *b.* cornbeef and cabbage; *c.* steak and potatoes; *d.* potatoes and butter; *e.* bacon and lettuce).

35. Foods that are chiefly protein include (*a.* steak and onions; *b.* lettuce and bread; *c.* potatoes and butter; *d.* steak and chicken; *e.* cornbeef and cabbage).

36. Vitamins are necessary in the diet for (*a.* regulating body temperature; *b.* giving flavor to food; *c.* furnishing energy; *d.* repairing tissues; *e.* maintaining normal health and growth).

37. Milk to be thoroughly safe should be (*a.* fresh; *b.* cold; *c.* pasteurized; *d.* heated to boiling; *e.* frozen).

38. To grow strong and firm, teeth and bones need (*a.* calcium; *b.* starch; *c.* protein; *d.* fat; *e.* sugar).

39. Two common causes of constipation are (*a.* too little exercise and eating bulky foods; *b.* regular exercise and eating too much starchy food; *c.* irregularity in the time of the bowel movement and eating whole wheat bread daily; *d.* regularity in the time of bowel movement and having a diet mainly of potatoes, meat and pie; *e.* little exercise and too great a quantity of starchy food in the diet).

40. The manufacturing of digestive juices is favored by (*a.* anger; *b.* cheerfulness; *c.* concentrated mental activity; *d.* excitement; *e.* worry).

41. We need bulky foods for (*a.* growth; *b.* repair; *c.* gaining weight; *d.* better elimination; *e.* better heat).

42. Typhoid fever is a (*a.* nervous disease; *b.* contagious disease; *c.* inherited disease; *d.* degenerative disease; *e.* disease with unknown cause).

43. Specific immunity is built up against smallpox by (*a.* having the smallpox and by vaccination; *b.* hygienic living and having colds; *c.* exposing oneself to typhoid and by vaccination for typhoid; *d.* increasing one's general resistance to disease by more sleep; *e.* eight hours of sleep daily and regular habits of eating good food).

44. The incubation period of a disease is the time elapsing between (*a.* exposure to the disease and the end of the disease; *b.* the appearance of the symptoms and the end of the disease; *c.* the exposure to the disease and the disappearance of symptoms; *d.* the appearance of the symptoms and the disappearance of temperature; *e.* the exposure to the disease and the appearance of the symptoms).

45. A factor which lowers one's general resistance is (*a.* an adequate diet; *b.* insufficient sleep; *c.* regular outdoor exercise; *d.* a shower after exercise; *e.* overweight under thirty years of age).

46. Cancer is a (*a.* nervous disease; *b.* inherited disease; *c.* disease with unknown cause; *d.* degenerative disease; *e.* contagious disease).

47. A procedure which should become a yearly habit is (*a.* hygienic living; *b.* eating regular meals; *c.* wholesome recreation; *d.* facing things squarely; *e.* a thorough medical examination).

48. An antitoxin is (*a.* a substance in blood serum which binds and neutralizes a toxin; *b.* a substance in blood serum that carries oxygen; *c.* a food having tissue building properties; *d.* a substance necessary for proper growth of the individual; *e.* a substance in the blood that increases general resistance).

49. Good posture is assumed when (*a.* the shoulders are back; *b.* the body segments are in as straight a line as possible and the position is one of ease; *c.* the lower back is not hollow; *d.* the knees are easy; *e.* the hips are under the spine).

50. Factors that are essential to good posture include (*a.* flexibility and lack of control; *b.* stiffness and good balance; *c.* balance and relaxation; *d.* balance and stiffness; *e.* rhythmic movement and stiffness).

51. A frequent result of poor posture is (*a.* less fatigue; *b.* increase in attractiveness of the individual; *c.* better fit of clothing; *d.* increase in body fatigue; *e.* grace and ease of movement).

52. When the correct relation of the body segments is maintained, the gravity line should pass through (*a.* lobe of ear, tip of shoulder, back of hip, and knee, front of outer ankle bone; *b.* lobe of ear, front of shoulder, front of hip, back of knee, front of ankle; *c.* lobe of ear, tip of shoulder, middle of hip joint, front of knee, back of ankle; *d.* lobe of ear, tip of shoulder, through middle of hip, knee and ankle joints; *e.* lobe of ear, tip of shoulder, middle of hip joint, back of kneecap, front of outer ankle bone).

53. Lordosis is (*a.* an exaggeration of the natural curve in the lower back region; *b.* lateral curvature of the spine; *c.* an exaggeration of the natural curve in the upper back region; *d.* a failure to allow the lower back to curve normally; *e.* a failure to allow the upper back to curve normally).

54. Forward head is a postural fault that is frequently accompanied by (*a.* round upper back; *b.* lateral curvature; *c.* wrong pelvic tilt; *d.* tense knees; *e.* flat feet).

55. Hollow back is called (*a.* kyphosis; *b.* scoliosis; *c.* lordosis; *d.* lateral curvature; *e.* dysmenorrhea).

56. The scientific name for hunch back is (*a.* scoliosis; *b.* dysmenorrhea; *c.* lateral curvature; *d.* kyphosis; *e.* lordosis).

57. The correct position of the lower back is (*a.* markedly concave; *b.* markedly convex; *c.* absolutely flat; *d.* slightly convex; *e.* slightly concave).

58. Wrong pelvic tilt is caused by (*a.* contraction of hip joint extensors and abdominal muscles; *b.* relaxation of knees; *c.* relaxation of lower back muscles; *d.* contraction of upper back muscles; *e.* relaxed abdominal and hip extensor muscles).

59. Scoliosis is (*a.* an exaggeration of the normal lower back curve; *b.* lateral curvature of the spine; *c.* an exaggeration of the normal upper back curve; *d.* a decrease in the normal upper back curve; *e.* carrying the weight on one foot).

60. The normal curves of the spine become habitually exaggerated when (*a.* one occasionally sits in a poor posture; *b.* one usually stands or sits with faulty weight distribution; *c.* the standing posture is at fault occasionally; *d.* the weight is borne on one foot for a few minutes every day; *e.* one sleeps with a pillow).

61. In the correct sitting posture (*a.* the hips should be against the back of the chair, the back straight; *b.* the shoulders should rest against the back of the chair, the hips somewhat away from the chair back; *c.* the upper back and head should touch the chair back, the hips sliding forward on the chair; *d.* the hips

and lower back should touch the chair back, the head bending forward; *e.* no part of the back should touch the chair back).

62. In sitting as in standing and walking, (*a.* the normal curves should be allowed to slump; *b.* the chest should be held up and the whole spine erect; *c.* the weight should be borne on the outside of the foot; *d.* the weight should be held up by the use of the back muscles only; *e.* the head should be allowed to fall forward).

63. In a good standing position the knees should be (*a.* bent; *b.* easy; *c.* locked; *d.* together; *e.* apart).

64. The correct contour of the upper back is (*a.* flat; *b.* slightly concave; *c.* markedly convex; *d.* markedly concave; *e.* slightly curved backwards).

65. Some common causes of foot troubles are (*a.* walking in low-heeled shoes; *b.* wearing low-heeled shoes and standing with the weight on the outside of the longitudinal arch; *c.* wearing ill-fitting shoes and walking with the weight on the inner side of the foot; *d.* wearing pointed toed high-heeled shoes while sitting; *e.* sitting too much).

66. The arch that runs from the heel to the ball of the foot is the (*a.* anterior arch; *b.* metatarsal arch; *c.* longitudinal arch; *d.* arch at the ball of the foot; *e.* transverse arch).

67. The correct use of the foot in walking is to bear the weight (*a.* on the toes; *b.* on the inside of the foot; *c.* on the heel; *d.* on the midline of the foot; *e.* on the inside of the foot and toeing out).

68. Relaxation or falling of the anterior arch is contributed to by (*a.* too great use of the toes in standing and walking; *b.* toeing in when walking; *c.* carrying the weight on the middle of the foot; *d.* wearing shoes that are too large; *e.* little or no use of the toes in standing and walking).

69. In standing and walking the feet should carry the weight with the (*a.* toes turned in, weight on the outer border; *b.* toes turned out, weight down midline of the foot; *c.* toes pointed straight ahead, weight down midline of the foot; *d.* toes pointed straight ahead, weight on inner border; *e.* toes turned in, weight on inner border).

70. A bunion is that defect of the foot commonly described as (*a.* toeing out; *b.* fallen anterior arch; *c.* fallen longitudinal arch; *d.* corn growth on small toe; *e.* enlarged and inflamed great toe joint).

71. Shoes with broad heels that are medium or low are better for everyday wear than high narrow heels because (*a.* one can take longer steps in them; *b.* one looks better in low heels; *c.* low heeled shoes wear longer; *d.* they cause less strain on the foot; *e.* they fit a narrow foot better).

72. The inner line of the shoe should be straight in order to (*a.* prevent the formation of a bunion; *b.* prevent fallen arches; *c.* prevent weakening of the anterior arches; *d.* prevent toeing out; *e.* prevent ingrown toe-nail).

73. An individual having a postural lateral curve will get the best results by (*a.* wearing a corset or brace; *b.* going to bed; *c.* having an operation; *d.* habitually maintaining a good posture; *e.* doing only one-sided exercises).

74. A student who carries one shoulder higher than the other probably has (*a.* lordosis; *b.* flat feet; *c.* kyphosis; *d.* forward head; *e.* scoliosis).

75. A helpful preventative measure to postural scoliosis is (*a.* wearing a corset; *b.* standing with the weight more on one foot; *c.* keeping the body in a good posture in the sitting and standing position; *d.* wearing arch support shoes; *e.* always carrying books in the right arm).

76. The correction for a hollow back is to (*a.* get the chest high; *b.* get the head back and chin in; *c.* contract the upper back and lower back muscles; *d.* contract the ham strings and chest muscles; *e.* contract the abdominal muscles and hip joint extensors).

77. The correction for hollow lower back is usually to (*a.* tilt the pelvis properly; *b.* straighten the upper back; *c.* bend the knees a little; *d.* get the head back and chin in; *e.* contract the abdominal muscles).

78. The function of menstruation is to (*a.* get rid of bad blood; *b.* get rid of poisonous matter; *c.* prepare the lining of the uterus for implantation; *d.* get rid of excess blood; *e.* clean the body).

79. Menstruation is normally absent during (*a.* middle life; *b.* puberty; *c.* pregnancy; *d.* late adolescence; *e.* adult life).

80. One of the factors which seems to contribute to a normal practically painless menstrual period is (*a.* eating less carbohydrate and meat; *b.* regularity in living; *c.* strenuous exercise; *d.* daily horseback riding; *e.* daily bath).

81. Ovulation is (*a.* the union of the sperm and the ovum; *b.* the development and discharge of the ovum; *c.* attachment of the fertilized ovum on the wall of the uterus; *d.* the time at which the life of the new individual begins; *e.* the age at which the reproductive organs develop).

82. The life of the new individual begins at (*a.* fertilization; *b.* coitus; *c.* implantation; *d.* lactation; *e.* birth).

83. Implantation is (*a.* the union of the sperm to the ovum; *b.* the attachment of the fertilized ovum to the wall of the uterus; *c.* the age at which the reproductive organs develop; *d.* the expulsion of a ripe ovum from the ovary; *e.* the development and discharge of an ovum).

84. The spermatozoon is (*a.* the male sex cell; *b.* a venereal disease; *c.* the female sex cell; *d.* another name for syphilis; *e.* the union of the male and female sex cell).

85. Pregnancy is (*a.* the period in which the reproductive organs develop; *b.* the time at which fertilization of the sperm and ovum occurs; *c.* the time at which the fertilized ovum is attached to the uterine wall; *d.* the period of the development of the foetus in the uterus; *e.* painful menstruation).

86. The placenta is (*a.* the attachment of the fertilized ovum to the uterus; *b.* the period of development of the foetus in the uterus; *c.* the organ by which the foetus is nourished; *d.* the union of the sperm and ovum; *e.* the period in which the reproductive organs are developed).

87. The organs which form the female sex cells and are homologous to the testes of the male are (*a.* vagina; *b.* ovaries; *c.* uterus; *d.* kidneys; *e.* Fallopian tubes).

88. The average menstrual cycle, once established, is about (*a.* 28 days; *b.* four or five days; *c.* a week; *d.* 35 days; *e.* nine months).

89. The hygiene of the normal menstrual period should include (a. the cessation of bathing; *b.* increase in amount of vigorous exercise; *c.* daily swimming; *d.* no exercise; *e.* little or no change in normal habits if good ones).

90. The best way to solve a conflict is to (*a.* dodge it by rationalization; *b.* evade it by projection; *c.* avoid it by an alibi; *d.* face it squarely and stick to the decision; *e.* avoid a solution as long as possible).

Staffs and Salaries in the Supervision of Health and Physical Education

By William G. Carr
Director, Research Division, National Education Association

THE SEVENTH biennial survey of salaries paid city school employees conducted by the Research Division of the National Education Association has just been completed.[1] This year the number of cities reporting was 1,989. Nearly three-fifths of all cities in the country, and practically every one of the Nation's larger cities are included. The complete reports of the study cover all types of employees. This article deals especially with the salaries paid supervisory officials in the health education field. It includes employees reported as directors, assistant directors, supervisors, and assistant supervisors of health and physical education.

Trends Since 1930–31.—It is well known that all school salaries have suffered reductions during the economic depression. Tables I and II show this trend in terms of the median salaries paid supervisors of physical education and of health respectively, as revealed by the biennial salary surveys for the school years 1930–31, 1932–33, 1934–35.

In reviewing these figures it should be remembered that probably the lowest point reached by salaries is not shown. Nation-wide estimates as compiled from state departments of education indicate that it was in 1933–34 that the average salary levels in the teaching profession reached their lowest point. Thus, for example, although supervisors of health in the larger city school systems suffered an average cut of 21.1 per cent in salaries between 1931 and 1935 (Table II, column 5) it is likely that the average reduction between 1931 and 1934 was even greater.

These figures should also be considered in connection with suitable measures of the cost of living. Although no index numbers of the cost of living are perfectly adapted to the teaching group, the following trends are indicated by recent reports of the National Industrial Conference Board:

Date	*Index of cost of living*
July, 1929	100.0
February, 1930	98.5
February, 1931	89.6
February, 1932	80.1
February, 1933	72.1
February, 1934	78.3
February, 1935	82.4

[1] The full reports of these surveys are available in various *Research Bulletins* and in the *Special Salary Tabulations*. Students of salary problems are invited to write the Research Division for further details.

TABLE I

SALARIES PAID SUPERVISORS AND ASSISTANT SUPERVISORS OF PHYSICAL EDUCATION IN 1930–31, 1932–33, 1934–35

Population groups	Median salaries paid supervisors of physical education					Median salaries paid assistant supervisors of physical education				
				Per cent decrease					Per cent increase or decrease	Per cent decrease
	1931	1933	1935	1931–35	1933–35	1931	1933	1935	1931–35	1933–35
1	2	3	4	5	6	7	8	9	10	11
I. Over 100,000	$3,690	$3,489	$3,138	15.0	10.1	$2,679	$2,906	$2,833	+ 5.7	2.5
II. 30,000 to 100,000	2,933	2,807	2,500	14.8	10.9	2,083	2,088	1,783	—14.4	14.6
III. 10,000 to 30,000	2,344	2,234	2,194	6.4	1.8	1,698	1,598	1,533	— 9.7	4.1
IV. 5,000 to 10,000	2,172	1,905	1,688	22.3	11.4	1,577	1,455	1,283	—18.6	11.8
V. 2,500 to 5,000	1,850	1,856	1,625	12.2	12.4	1,514	1,375	1,294	—14.5	5.9

TABLE II

SALARIES PAID SUPERVISORS OF HEALTH, 1930–31, 1932–33, 1934–35

Population groups	Median salaries paid supervisors of health				
	1931	1933	1935	Per cent decrease	Per cent decrease
				1931–35	1933–35
1	2	3	4	5	6
I. Over 100,000	$4,120	$3,543	$3,250	21.1	8.3
II. 30,000 to 100,000	2,520	2,533	2,450	2.8	3.3

Salaries and City Size.—Tables I and II bring out the usual tendency for salaries to increase with the size of the city. The figures do not indicate for these particular positions that any one group of cities has suffered more severely than any other. No groups, and very few individuals within the teaching profession, have escaped salary reductions. There is already a slight tendency toward restoration. It remains to be seen, however, whether present trends toward economic recovery and higher living costs will be paralleled by salary increases or whether school employees will be left stranded at the low levels enforced by the depression.

Number of Supervisors.—The extent to which the depression has reduced the number of health and physical education supervisors may be gauged by the figures from twelve of the larger cities (all over 500,000 in population) which reported the number of such employees in 1931, 1933, and 1935. These twelve cities together reported in 1931, 147 supervisors of health and physical education. The comparable figure reported for 1933 was 110 and for the current school year 101. In other words, the number of health and physical education supervisors in these city school systems, has decreased approximately 31 per cent. It should be remembered, however, that the number of employees may not be used as a complete measure of the amount of supervision rendered because the assignments of duties to the various types of positions vary from time to time even within the same city. When health and physical education supervisors are assigned heavy administrative and teaching responsibilities, as has tended to be the case during the last few years, the supervision has actually been curtailed even though the number of employees holding the title "supervisor" might remain unchanged.

I. Over 100,000	$4,120	$3,543	$3,250	21.1	2.8	3.3
II. 30,000 to 100,000	2,520	2,533	2,450			

Postoperative Treatment of Knee Injuries

By Edward D. O'Donnell
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BEFORE beginning the postoperative treatment of a knee which has been injured, it is essential that the physical therapist acquaint himself with as many of the facts surrounding the case as possible.* The history of the original injury should be learned so that a clear idea may be obtained of the damage which has been sustained. The duration of the disability before the operation was performed should also be carefully determined, as this will have a very direct effect upon the length of time over which postoperative treatment will be necessary. It is customary for surgeons to treat many knee injuries by means of conservative measures over a varying period of time before resorting to operative procedures, and these measures should also be known to the physical therapist, if possible. The vast majority of knee injuries may be grouped under three general types: first, tear of the internal or external lateral ligaments; second, injury to the semilunar cartilages; and third, injury to the crucial ligaments. There is a smaller group of less frequent knee injuries which do not need to be considered at this time. It is probable that the primary injury in most cases is a tear of the internal or external lateral ligament and subsequent to this, or coincidentally with this, damage occurs to the semilunar cartilages or crucial ligaments. Of course, the close association between the joint capsule with its synovial lining, and the lateral ligament must be borne in mind as there is usually some damage to the synovial membrane and capsule at the same time as tear of the ligaments. Treatment must therefore be carried out with this fundamental idea in mind; that the lateral ligament has been injured, thus allowing for instability of the knee in regard to lateral motion, and that in all treatment following any knee injury, either directly or postoperatively, great care must be taken to prevent strain falling on the ligament which is healing or which has been repaired.

The type of incision must be noted by the physical therapist, as a long incision means that more extensive procedures have been carried out within the knee than a short one, and that more care and perhaps a longer period of postoperative treatment must be followed through, in order to bring about a complete repair. It is well also to know the type

* I am greatly indebted to Dr. Winthrop Morgan Phelps, Orthopaedic Surgeon to the Yale University Department of Health, and Professor of Orthopaedic Surgery in the Yale University School of Medicine, for his assistance in the preparation of this paper.

of operation which has been performed, that is, whether it has been a simple removal of a torn cartilage or whether there has been extensive repair of the lateral ligament or crucial ligament. A torn cartilage alone, which has been removed, is of no significance in the treatment of the postoperative knee as the cartilage is no longer a factor in motion since it has been removed. The anterior crucial ligament is the ligament which prevents extension of the knee beyond a straight line, and damage to this ligament must be considered carefully by the physical therapist during treatment in order not to allow strain to fall upon it by extension of the knee beyond the straight line.

The results of injury or operation upon a knee are in some respects similar. First, swelling is present. It must be borne in mind that this swelling may consist of blood, from a tearing of one of the vessels by the injury to the knee, or may be an increased amount of synovial fluid within the joint as the result of irritation of the synovial membrane by the injury. The possible double nature of this swelling must therefore be kept in mind. A second factor is the presence of pain. Pain is due essentially to the tearing of the smaller nerve filaments running throughout the ligaments and subcutaneous tissues around the knee. The presence of pain is an indication of strain on the various structures which have been injured or operated upon. It is therefore essential that motion should not be carried out beyond the limits of pain in the postoperative treatment at any time. Pain is also felt in the early stages postoperatively as the result of a pull of the sutures on the tissues, which have been used in the repair.

The general plan of treatment, therefore, should be worked out according to all the factors which have been considered. First, the original damage to the knee and the type of operation and incision used. Second, the findings at operation and the type of repair of the structures constituting the joint. The aim of treatment should be restoration of complete function as early as possible as is consistent with the speed of healing. This should be accomplished by the prevention of atrophy and the prevention of adhesions, by early motion within the limits of discomfort. Great caution should be observed in order to prevent interference with repair and the prevention of early strain on the sutures by any tendency towards lateral or abnormal mobility in the joint during the early mobilization.

TECHNIQUE OF TREATMENT

Immediately following the operation, the knee is partially immobilized by means of a posterior wooden or plaster splint held in place by semi-elastic bandages. The splint is used only for a period of three days. On the fourth day, the splint is removed and the knee supported by semi-elastic bandages and felt strips. On the fifth day, light effleurage

of the quadriceps extending from a point directly above the incision up to the groin is carried out to empty the lymph channels and promote absorption of the fluid. The patient is also instructed at this time in quadriceps setting. Quadriceps setting is an active attempt on the part of the patient to tighten the quadriceps muscle. This is done by making a voluntary attempt to extend the knee and lift the heel from the bed but is not carried to the point where any motion results. The patient soon learns, by this method, to tighten the muscles voluntarily, pulling the patella upward. He should be instructed to carry this out a large number of times every day as it strengthens the quadriceps early and prevents much of the subsequent and unnecessary atrophy. The patient is allowed in a wheel chair when he is able to elevate his extended leg voluntarily from the bed. It is felt that when he is able to do this, he is able to protect the structures about the joint sufficiently to prevent any tendency to tearing of the suture line in getting in and out of the chair. The stitches are removed usually on the eighth day, and if the wound is healed, the patient is allowed on crutches on the ninth day. He is cautioned to wear shoes with leather soles and heels rather than bedroom slippers. He is instructed to walk by means of carrying the crutches forward with the affected leg, moving the affected leg through the usual walking motion but with the weight on the crutches. He is to do this in order to allow some slight motion in the knee joint instead of carrying the leg flexed. The amount of weight which he places on the foot can be regulated to increase daily, by means of the patient voluntarily lessening the weight on the crutches each day. On the ninth day also, *active* flexion and extension under the direction of the physical therapist is begun. This is carried at first through only a very few degrees of motion and is watched by the physical therapist to prevent any tendency toward lateral or twisting strains occurring within the joint. As soon as the dressings can be removed, two long felt strips are applied, one on each side of the patella, and held in place by means of a semi-elastic bandage. The purpose of these strips is to give slightly increased support and to prevent the semi-elastic bandage from pressing directly on the patella. If the bandage is applied tightly below the joint and is allowed to be more loosely wound above the joint, it will also tend towards compression in a direction to promote absorption of any residual swelling which may be present. The patient is usually discharged on the tenth day. A measure of the circumference of the two thighs, at a given distance above the patella, is made on the day of leaving the hospital, for future reference to determine the rate of increase in the development of the atrophied muscles. It is recommended that after discharge from the hospital, the patient receive daily treatment, if possible, for three or four weeks.

During the first week of treatment, after the patient leaves the hospital, the technique is as follows: The patient is placed on the plinth in

the supine position. A pillow is placed beneath the knee in order to allow five to ten degrees of flexion. A light effleurage of the quadriceps, beginning at the groin and using only upward strokes, is carried out. This effleurage is gradually extended in such a way that the upward stroke begins at a lower and lower point and is carried upwards to the groin until the entire length of the thigh is massaged from the upper end of the incision. Quadriceps setting is carried out as was directed while the patient was in the hospital. Active straight leg raising is then carried out with the assistance of the physical therapist, who watches carefully the alignment of the thigh and leg, to prevent any lateral or uneven strain on the lateral ligaments. Active flexion with the heel on the plinth is begun by means of the patient attempting to lift the knee from the pillow. This is carried out only within the limits of discomfort. The leg is steadied throughout this manoeuver also, to prevent any tendency to lateral strain. The patient is then placed in the prone position with his foot on a small pillow in order to bring about relaxation of the hamstring muscles. Hamstring effleurage and light kneading are then carried out from the popliteal space to the groin with the effleurage following the method explained for the quadriceps. Active assisted flexion and extension are then carried out. Straight leg raising from the prone position is carried out actively by the patient by means of hyperextension of the hip.

This treatment should take about forty-five minutes. During this stage of the treatment also, no heat is used in any form. The reason for this is that all damage to the knee is supposedly corrected by means of the operative procedure and the slightly weakening effect of the heat on the musculature is contraindicated as the entire treatment is aimed at strengthening of the musculature of the thigh and leg.

During the second week, the treatment continues essentially the same except that gentle kneading is added to the effleurage of the quadriceps and the amount of quadriceps setting and the range of motion in the knee, both in the prone and supine position, are increased. During this week, the patient is beginning to walk entirely without crutches. A cane may be substituted if the patient feels any tendency to insecurity. A careful control of the shoes should be made and the patient should wear only leather shoes with heels and with firm flat soles.

About the third week, the circumferences of the thighs are again measured and compared with that immediately following discharge from the hospital. The degree of active motion utilized after this period will depend upon the amount of return to full circumference of the weakened muscles. During the third week, the patient is allowed to sit on the edge of the table and extension of the knee against gravity and resisted flexion of the knee, supporting the thigh in such a way that there is no tendency to mal-alignment of the joint, is carried out. Graduated resisted

flexion and extension are added to the exercises throughout the full range of the joint.

At this point, it must be borne in mind that the various component parts of the quadriceps muscle do not act in the entire range of motion. For example, it may be easily seen by observation that the vastus medialis, which lies medial to, and a few centimeters above the patella, does not come into contraction until the last five degrees of extension of the knee are performed. The rectus femoris, on the other hand, begins to contract when the knee is moved from an acutely flexed position out to slightly beyond a right angle. From this point on, the vastus lateralis may be felt to contract and, as has been said, the vastus medialis enters the picture only during the last 5 degrees of motion. It is, therefore, necessary to consider all of these three components of the quadriceps in carrying out resisted motion. Resisted motion is utilized, therefore, in three general positions. First, throughout the last 5 degrees of motion from this point to full extension. Because of the weight of the leg in this position, active assisted motion may have to be given for some time in order to assure full extension of the knee. As soon as the patient is able to bring the leg to a right angle, resisted motion is carried out from this point up to within 5 degrees of full extension in order to strengthen the vastus lateralis. When the patient has reached the stage where acute flexion is possible, resisted motion is carried out from this point, in order to strengthen the rectus femoris. The three general positions, therefore, are from acute flexion to about 100 degrees; from 90 to 170 degrees; and from 160 to 180 degrees. It may be seen that there is a slight overlap in the positions. In this way, full strength of the musculature will be obtained evenly throughout the entire range. Attention must be given also to the hamstrings because they take a definite part in the atrophy which is found in all of the muscles of the thigh. During the third week, in most cases, the use of the stationary bicycle can be begun and it is advised that there be no resistance placed in the wheel at this time. The patient should be instructed to push harder with the affected leg than with the normal one in order that he will not also strengthen the normal leg and slow up the return to an equality of the size of the circumferences of the thighs. The seat of the bicycle should be used in two positions: first, in the high position in order to obtain full extension with each stroke; and second, in the low position to increase strength in the flexed part of the motion. At first, the bicycle should be ridden for a distance of about a mile, if a distance indicator is present, or for about ten minutes if the indicator is not present. The time on the bicycle is gradually increased.

During the fourth week, the time on the bicycle is still more increased and some resistance is applied to the wheel. Resisted flexion and extension in all positions are carried out and any tendency to lack

of straight alignment of the leg must be eliminated. At this time, also, the rowing machine is added to the bicycle in order to give more exercise for flexion and extension. This machine is very useful as there is no tendency to a mal-alignment of the joint.

During the fifth week, the patient is allowed to jog and run on straight courses. He must be very careful when approaching any turns and should be instructed to stop running until he has passed the curves. Weight-bearing exercises, including deep-knee bending, etc., can be added at this point but the patient must be careful not to twist or allow any lateral strain to come on the joint during these exercises.

In the sixth week, the intensity of the exercises is greatly increased and the amount of free exercise is added to, still avoiding any lateral strain. The patient is discharged from treatment when the circumferences of the two thighs are equal and never before. He is then allowed to indulge in any form of exercise which he desires. This is usually some time between the eighth and twelfth week.

During the postoperative treatment of knees, it is advisable for the surgeon or one of his assistants to observe the knee at weekly intervals and to make the final discharge from treatment upon final examination when the circumferences of the thighs are equal.

In conclusion, it may be stated that more than one hundred cases have been treated in the last eight years by the physical therapy régime outlined and in all uncomplicated cases of torn ligaments, cartilages, and the like, a complete return to full use of the knee without the addition of any brace or apparatus has resulted. A few cases have been referred to this clinic which have been operated upon elsewhere, complaining of an imperfect result. In these cases, it has been found that the operative procedure has been entirely satisfactory, but that the postoperative treatment has not been thoroughly carried out. By instituting a régime such as described in these cases, a return to full and perfect function of the knee has resulted in each of these cases.

Response of the Normal Prepubescent Heart to Exercises of Graded Intensities*

By MABEL J. SHIRLEY
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FOR SOME time we have been confronted by spoken and written opinions that the child's heart is weak and it therefore should not be subjected to exercises at all strenuous. Tyler[1†] states that the volume of the heart doubles during the first two years. During the next seven years, between the ages of seven and fourteen, its increase is slower, adding about two-thirds of its volume at seven.

Terman and Almack,[2] in comparing the child's heart with his arteries, state that the heart is small and must beat with great rapidity in order to maintain a normal blood pressure. During growth the width of the heart increases twelve times. The adult ratio between the heart and arteries is not attained until the later years of adolescence, previous to which time all exercises and games making heavy demands on strength or endurance are dangerous.

Williams[3] refers to the prepubescent period as "the fatigue years" because of the slow development of the heart. He takes this attitude because of the fact that at this time the heart's weight is less than one-fourth its adult weight, and yet it has to pump blood to a body that has two-thirds of its adult weight. The great increase in the desire for activity at this time contributes to the demands on the heart, and for these reasons Williams believes that the child's activity should be carefully guided.

Such opinions based on anatomical relationships have resulted in the widely accepted assumption that because the child's heart is small as compared to the size of his body, it is undeniably weak, and that the child should be hedged about by restrictions placed on his activity. It has occurred to us that Nature might not have given the normal child such an abundance of energy if the exercise of it were to be detrimental to the child. Furthermore, a lack of scientific evidence in support of many of the traditional ideas about the child's heart makes us hesitant about accepting some of them.

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* From the Department of Physiology, State University of Iowa. Presented before the Research Section at the Central District meeting in St. Paul, 1934, and later revised for publication.

† Numbers refer to bibliography at the end of the paper.

A search through literature reveals the fact that there is but little experimental evidence in support of the concept of the inefficiency of the child's heart in response to exercise. The present investigation is an attempt to throw some scientific light on the question as to whether the traditional hypothesis of the weak heart of the child is more than tradition.

A survey of the possible approaches to the question of cardiac efficiency shows that the chief method employed is some measure of the response of the heart to exercise. Since the problems involved in this type of investigation are so diversified, it was necessary to limit our research at this time to a single phase of the cardiac response. A review of literature suggested an investigation of the effect of exercise on the rate of the child's heart, and a comparison of such response with that of the adult heart.

REVIEW OF LITERATURE

A survey of literature gave no clue as to the nature of the response of the prepubescent heart to exercise, other than that there is an increase in force and rate. It did, however, yield a method whereby we could compare the responsiveness of the child's heart with that of the adult heart.

Tuttle and Wells[4] studied the effects of exercises of graded intensity upon the heart of the normal adult by means of the pulse-ratio technique. These investigators pointed out that although it was generally agreed that exercise increases the heart rate, and that within the limits of cardiac response the more strenuous the exercise the faster the heart rate, the exact relationship between exercises of graded intensity and heart rate was unknown. In order to establish this relationship, Tuttle and Wells employed the pulse-ratio technique.§ The pulse-ratio is found by dividing the total pulse for two minutes after a prescribed exercise by the normal resting pulse for one minute. Their procedure was as follows: A standard exercise was selected which would give a pulse-ratio slightly but definitely above 2.00. A more strenuous exercise was used which would give a pulse-ratio definitely higher than the first, yet well within the limits of the heart rate. Then the two values were found experimentally and were represented graphically by plotting the pulse-ratio on the ordinate and the exercise on the abscissa. These two points were then connected by a straight line. It was evident that if the heart rate increases in direct proportion to the severity of exercise, and if the relationship is rectilinear, then the pulse-ratio for any exercise intermediate to those used in establishing the straight line will fall on that line somewhere between the two points.

In order to test this hypothesis, 124 experiments were carried out

§ The pulse-ratio technique is described in detail by Tuttle in the RESEARCH QUARTERLY. II: 2 (May, 1931), 5-17.

by Tuttle and Wells. The experiments were performed from slightly different angles, but one set of data is shown in Table I for the purpose of illustration. The exercises used were 18 and 40 stool-steppings per minute for 1 minute of each. The pulse-ratio for each subject for each exercise is given in the table. The next step was to calculate the ratio for the intermediate exercises of 25, 30, and 35 steps respectively. These occur in the column under the caption "Calculated Ratio."‖ Then, in

TABLE I

A Comparison of Calculated and Experimental Pulse-Ratios Obtained from Three Exercises of Different Intensities
(Taken from Tuttle and Wells[4])

Subject No.	Normal pulse	Exercise 18 steps per minute	Exercise 40 steps per minute	25 steps Calculated ratio	25 steps Experimental ratio	25 steps Difference	30 steps Calculated ratio	30 steps Experimental ratio	30 steps Difference	35 steps Calculated ratio	35 steps Experimental ratio	35 steps Difference
1	80	2.13	2.80	2.34	2.40	.06	2.50	2.53	.03	2.65	2.65	.00
2	64	2.06	2.69	2.26	2.28	.02	2.40	2.43	.03	2.55	2.52	.03
3	83	2.18	2.63	2.32	2.29	.03	2.43	2.46	.03	2.53	2.55	.01
4	64	2.17	2.56	2.29	2.33	.04	2.38	2.38	.00	2.47	2.45	.01
5	64	2.04	2.81	2.29	2.28	.01	2.46	2.45	.01	2.64	2.64	.00
6	64	2.16	2.88	2.39	2.41	.02	2.55	2.48	.07	2.72	2.72	.00
7	80	2.10	2.80	2.32	2.30	.02	2.48	2.47	.01	2.64	2.65	.01
8	78	2.18	2.66	2.33	2.35	.02	2.44	2.45	.01	2.55	2.56	.01
9	72	2.11	3.20	2.46	2.45	.01	2.70	2.74	.04	2.95	2.90	.05
10	82	2.10	2.59	2.26	2.28	.02	2.37	2.35	.02	2.48	2.45	.03

order to see if the responses of the hearts were directly proportional to the severity of exercise and rectilinear in nature, the ratios for the 3 intermediate exercises were tested experimentally. The differences between the calculated and experimental ratios are shown in the appropriate column for each intermediate exercise. This comparison shows that the calculated and experimental ratios do agree, within the limits of experimental error in pulse counting, the mean difference being only .02 pulse-ratio, and the range being from .00 to .07 pulse-ratio. In counting pulse after exercise there is always a possibility of missing beats between the cessation of activity and the beginning of the count. In the experiment there are 3 different counts, each of 2 minutes duration, and split beats might thus be responsible for some of the variation between calculated and experimental ratios. Emotional and environmental factors probably explain the rest of the differences, in the experiments on normal

‖ Since they were dealing with a rectilinear relationship, r meaning pulse-ratio may be substituted for x, and e meaning exercise may be substituted for y in the straight line equation $\frac{y_0 - y_1}{x_0 - x_1} = \frac{y_1 - y_2}{x_1 - x_2}$. Then by factoring $r = \frac{r_2 - r_1}{e_2 - e_1}(e - e_1) + r_1$. This serves as a mathematical formula for finding any ratio where e_2 is the strenuous exercise, e_1 the light exercise, r_2 the ratio corresponding to e_2, and r_1 the ratio corresponding to e_1.

hearts. Tuttle and Wells state that an error of 5 beats would be within the limits of experimental error in pulse counting over three 2-minute periods.[4]

Tuttle and Wells proved conclusively that the increase in heart rate is directly proportional to the intensity of exercise, and that the curve representing the relationship is rectilinear. Mathematically stated, the correlation between experimental and calculated ratios was .929 ± .008.

Sievers[5] employed the pulse-ratio technique as a means of detecting abnormal hearts. His procedure was to compare calculated and experimental ratios in hearts diagnosed by physicians as abnormal, to see if they responded in the same way as did normal hearts. The pulse-ratio test was given to thirty-two subjects. The group consisted of six cases of functional murmurs, sixteen cases of organic lesions in which there was definite evidence of failure to compensate, six cases of organic lesion in which there was no evidence of heart failure, two cases of neurogenic hearts, and two cases about which there was some disagreement. Of these groups the physicians had prescribed restricted exercises for only the decompensated organic lesion cases.

The results of the experiments showed that in the cases exhibiting decompensated organic lesions the hearts did not respond to exercise in a manner comparable to normal hearts. This fact was strikingly brought out by the fact that the calculated and experimental ratios differed greatly. The figures are shown in Table II. By referring to the column of "Differences" it is evident that the variations are far beyond the experimental error in counting the pulse, the range difference being from .15 to .38 pulse-ratio, the mean being .22 pulse-ratio.

It was concluded from this investigation that the pulse-ratio technique is reliable for detecting non-compensated organic heart lesions, since their response is not directly proportional to the severity of exercise, and the relationship is not rectilinear.

OUR PROBLEM

On the basis of the two investigations just reviewed, we set out to determine whether or not the child's heart responds to exercise in a manner comparable to the normal adult heart.

TECHNIQUE

The technique was essentially as follows: It was necessary to select an exercise that was standard, simple to administer, and well within the ability of all children to perform. It must also lend itself to objective scoring. Since stool-stepping has been proved to meet these requirements, it was adopted. The exercise consisted of stepping on and off a low stool a definite number of times per minute. The stool used is twelve inches high, and solidly built so it can be mounted and dismounted satisfactorily. The exercise is carried out in a regular rhythm, with four

TABLE II

A Comparison of Calculated and Experimental Pulse-Ratio of Non-Compensated Organic Lesion Cases
(Taken from Sievers[5])

Subject No.	Normal pulse	Light Exercise	Heavy Exercise	Pulse Ratio Light Exercise	Pulse Ratio Heavy Exercise	Inter. Exercise	Experimental ratio	Calculated ratio	Difference
1	82	18	42	2.23	2.80	25	2.19	2.39	.20
2	84	12	40	2.42	3.52	30	2.91	3.12	.21
3	78	12	40	2.12	3.07	20	2.17	2.38	.21
4	64	20	40	2.12	3.06	25	2.16	2.33	.17
5	84	12	30	2.30	2.98	20	2.34	2.59	.25
6	86	12	40	2.07	2.61	20	2.07	2.22	.15
7	75	18	40	2.25	3.58	25	2.44	2.67	.23
8	70	18	50	2.15	2.70	40	2.34	2.52	.18
9	80	20	35	2.22	2.97	30	2.51	2.72	.21
10	94	18	40	2.10	2.71	30	2.28	2.42	.14
11	71	18	40	2.09	3.11	25	2.25	2.41	.16
12	85	12	40	2.06	3.10	20	2.15	2.35	.20
13	56	18	40	2.21	3.57	25	2.35	2.63	.28
14	71	12	40	2.09	3.91	20	2.23	2.61	.38
15	80	20	40	2.05	3.95	30	2.26	2.50	.24
16	88	12	40	2.02	3.03	25	2.23	2.49	.26

steps to each stool-stepping cycle. The subject is seated in such a position that upon rising he can immediately begin the work. On count one, the left foot is placed on the stool, and on count two the right foot, so the subject is in an upright position on top of the stool. On count three the left foot is replaced on the floor, and on count four the right. This constitutes one stool-stepping cycle, or "one step."

The technique required two exercises of different intensities, one light and one fairly strenuous. For light exercise the subject stepped on and off a stool for one minute at the rate of twelve steps per minute. For the strenuous exercise the subject stepped on and off at a faster rate, twenty-five steps per minute. The rate was established and maintained by a calibrated metronome, equipped with a signal bell which was set to ring every fourth beat, or at the beginning of each stool-stepping cycle.

The pulse-ratio was determined, as previously stated, by dividing the pulse for 2 minutes after a known exercise by the normal resting pulse for 1 minute. For example, suppose the normal resting pulse for 1 minute is 80 and the total pulse for 2 minutes after a prescribed exercise is 176. Then the pulse-ratio is represented by 176/80 or 2.20.

In order to compare the response of the prepubescent heart to exercises of graded intensities with that of the adult heart, the pulse-ratios for light and more strenuous exercises were found and repre-

sented graphically by plotting the exercises on the abscissa and the pulse-ratios on the ordinate. Then, by using a straight line to connect the two points representing light and strenuous exercise, we had a set-up for comparing the calculated and experimental ratios for any exercise of intermediate intensity. Now, if the child's heart responds to exercise in a manner like that of the normal adult heart, then the experimental ratio and the calculated ratio will coincide.

Although the ratio may be found graphically, a formula has been established for calculating it, by which $r = \frac{r_2 - r_1}{e_2 - e_1} (e - e_1) + r_1$, where e_2 is the strenuous exercise, e_1 the light exercise, r_2 the ratio corresponding to e_2 and r_1 the ratio corresponding to e_1. For example, suppose the ratio for the strenuous exercise to be 2.13, that for the light exercise 2.05, the strenuous exercise being 25 steps and the light exercise 12 steps; the formula becomes r (the ratio for 18 steps) $= \frac{2.13 - 2.05}{25 - 12} (18 - 12) + 2.05$. Clearing this, $r = \frac{.08}{13} (6) + 2.05$, or 2.09 pulse-ratio, the ratio for 18 steps.

DATA

Data were collected on thirty-four boys and girls between the ages of nine and eleven. Since there was no apparent difference between the cardiac responses for boys and girls, the sex factor is disregarded.

The data are considered under two headings, since there was some question as to the normalcy of the cardio-vascular systems of some of the children, and since a few of them did not possess sufficient fundamental rhythm sense to permit them to perform stool-stepping successfully.

The results of experiments on those unquestionably normal are presented in Table III. The data shown are for twenty-six of the thirty-four children examined.

In the column marked "Exercise," the pulse-ratios for 12 and 25 steps are given. In the column marked "18 Steps a Minute" the calculated and experimental ratios for 18 steps are presented. The column labeled "Difference" shows how closely the experimental ratios approximate the calculated ratios. The mean difference is only .02 pulse-ratio, with a range of .00 to .05 pulse-ratio. These differences fall well within the limits of experimental error in pulse counting.

It is evident from these data that the response of the prepubescent heart to exercises of graded intensity is directly proportional to the severity of exercise, and that this relationship is rectilinear. This proves that the heart of the normal prepubescent child responds to exercise in exactly the same way as does the normal adult heart.

The relationship between the calculated and experimental ratios of

TABLE III

A Comparison of Calculated and Experimental Pulse-Ratios Obtained from Two Exercises of Different Intensities

Subject No.	Normal Pulse Min.	Exercise 12 steps per min.	Exercise 25 steps per min.	18 steps per min. Calculated ratio	18 steps per min. Experimental ratio	Difference
1G	105	2.04	2.14	2.09	2.10	.01
2G	84	2.01	2.32	2.15	2.14	.01
3G	93	2.14	2.24	2.19	2.22	.03
4G	108	2.04	2.21	2.12	2.10	.02
6G	106	2.06	2.14	2.10	2.13	.03
7G	92	2.17	2.23	2.20	2.19	.01
8G	88	2.06	2.16	2.10	2.08	.02
9G	105	2.05	2.14	2.09	2.09	.00
11G	99	2.04	2.10	2.07	2.04	.03
13B	84	2.01	2.13	2.06	2.10	.04
15B	91	2.09	2.11	2.10	2.06	.04
16B	83	2.11	2.19	2.15	2.14	.01
17B	78	2.09	2.26	2.17	2.21	.04
18B	87	2.01	2.23	2.11	2.06	.05
19B	100	2.22	2.31	2.28	2.31	.03
20B	104	2.02	2.16	2.09	2.10	.01
23G	97	2.10	2.24	2.17	2.18	.01
24G	79	2.11	2.15	2.13	2.17	.04
26B	103	2.05	2.13	2.09	2.09	.00
27B	101	2.06	2.28	2.16	2.15	.01
28B	112	2.04	2.15	2.09	2.11	.02
29B	104	2.05	2.17	2.10	2.09	.01
30B	80	2.12	2.29	2.20	2.22	.02
32B	93	2.09	2.17	2.13	2.15	.02
33B	96	2.09	2.30	2.19	2.15	.04
34G	79	2.05	2.06	2.06	2.08	.02

four prepubescent hearts is shown in Figure 1. Although the difference between these ratios may appear to be rather wide, it must be remembered that each division on the ordinate represents only one one-hundredth of a pulse-ratio.

The questionable cases are shown in Table IV. There are eight cases in this group, each of which deserves special consideration. Cases 5G and 25G seemed to lack basic rhythm sense and were therefore unable to meet the requirements of the experiment as to rhythmically stepping on and off the exercise stool. It is of interest to note that the pulse-ratios after twelve and twenty-five steps are practically the same.

Case 21B is evidently a case of noncompensated organic heart lesion. This child was not retested because he complained of discomfort after exercise. The five remaining cases, although they check within the upper limits of error in pulse counting, as defined by Tuttle and Wells,[4] are included in this group since it was necessary to repeat the experiment on them several times, for various reasons. Chief among these reasons was the prevalence of bad colds. In other cases the experimenter's inability to command the attention of some of the children no doubt

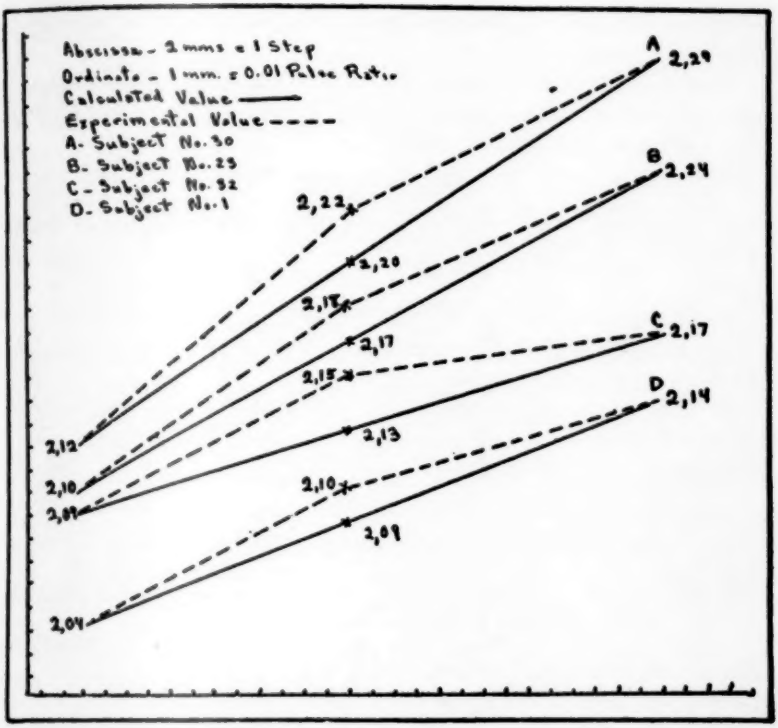

FIG. 1.—The relationship between calculated and experimental pulse ratios.

TABLE IV

THE RECORDS OF SUBJECTS WHOSE EXPERIMENTAL RATIOS DIFFERED WIDELY FROM THE CALCULATED RATIOS

Subject No.	Normal Pulse Min.	Exercise		18 steps per min.		
		12 steps per min.	25 steps per min.	Calculated ratio	Experimental ratio	Difference
5G	94	2.02	2.03	2.03	1.97	.05
10G	105	2.06	2.22	2.13	2.21	.08
12G	89	2.10	2.20	2.15	2.07	.08
14B	94	2.00	2.09	2.04	1.96	.08
21B	108	2.02	1.94	....	1.95	...
22B	84	2.01	2.13	2.06	2.15	.09
25G	86	1.92	2.03	1.97	2.04	.07
31B	76	2.08	2.26	2.16	2.08	.08

distorted the results, and therefore may have yielded figures which did not represent the true state of affairs. It was interesting to note how much various disturbances affected the pulse rate in children, for example, hearing windows rattling, stumbling while doing stool stepping,

being curious about the metronome and stop watch, and attempting to keep from coughing.

Due to reasons which we could not control, the questionable cases were not carried further to determine the truth or falsity of our assumption relative to their cardiac conditions.

CONCLUSIONS

On the basis of the examination of thirty-four prepubescent hearts by means of the pulse-ratio technique, the following conclusions are drawn:

1. The response of the normal prepubescent heart to exercises of graded intensity is directly proportional to the severity of exercise, and this relationship is rectilinear.

2. The normal prepubescent heart responds to exercises of graded intensity in a manner exactly like that of the normal adult heart, within the limits of this experiment.

BIBLIOGRAPHY

1. Tyler, John Mason. *Growth and Education*, p. 82. Boston: Houghton Mifflin Co., 1907.
2. Terman, Lewis M., and Almack, John C. *The Hygiene of the School Child*, pp. 55-56. Chicago: Houghton Mifflin Co., 1929.
3. Williams, Jesse Feiring, *Principles of Physical Education*, pp. 129-130. Philadelphia: W. B. Saunders Co., 1927.
4. Tuttle, W. W., and Wells, George. "The Response of the Normal Heart to Exercises of Graded Intensity." *Arbeitsphysiologie*, 4 (1931), 519-526.
5. Sievers, Henry. "A Simple Method for Detecting Abnormal Hearts by the Use of the Pulse-Ratio Test." RESEARCH QUARTERLY, VI: 2 (May, 1935), 31-38.
6. Tuttle, W. W. "The Use of the Pulse-Ratio Test for Rating Physical Efficiency." RESEARCH QUARTERLY, II: 2 (May, 1931), 5-17.

Achievement Scales in Athletics for College Women*

By Hazel J. Cubberley

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BEFORE an attempt could be made to set up achievement scales in physical education activities for college women it was necessary to determine the influence of the factors of age, height, and weight upon performance.

During the year 1933–34 an unselected group of four hundred college women at the University of California at Los Angeles was given a battery of six tests including the following: basketball throw for distance, baseball throw for distance (twelve-inch playground ball), jump and reach, run and catch, baseball throw for accuracy, and dodging (or maze) run.

Briefly, the conclusions resulting from this study are (1) that the factors of age, height, and weight have almost a negligible effect upon performance in a variety of athletic achievement tests for college women; (2) that college women represent a homogeneous group and in achievement scales set up for them only one performance classification or grouping is necessary.

These results influenced us to disregard the factors of age, height, and weight in setting up the achievement scales for college women in the fundamental elements of the team games.

THE next problem was to agree on the type of tests that would be most valuable for college women in the field of athletics. Test elements in the team games such as basketball and hockey were chosen because there seems to be a real need for some objective measurement of achievement in these activities.

After deciding on the specific elements which are fundamental in playing the game, tests were chosen that the students themselves might recognize as important, specific tests in definite game elements as opposed to a general test in which the student might not see the application.

In general, we limited our field of possible selection:

First, to tests that would include just one element so that the score

* Report delivered to the Western Society of Departments of Physical Education for College Women, December 20, 1934.

would be measured by a single unit, as feet and inches, or number of seconds, or the total of a target score, and not by a combination of these measurement units.

Second, to tests that would involve just the individual student; tests that would reduce the possible error and rule out the human equation; in other words, the contestant must not be jeopardized or helped by having another person pass, throw, or propel in any way the ball or object used in the test. (The timer or scorer must continue to be a "necessary evil" until such time as electrical or other automatic devices are invented and made practicable.)

Third, to tests that seem to have a basis for validity—tests that measure what they purport to measure. For instance, no further claims are made for the jump and reach than that the student's record shows her achievement in jump and reach at the particular moment when she takes the test. If it so happens that this record in jump and reach, or in any of the other tests, should be indicative of general ability in the team game situation, then that will be a valuable outcome of the test results. At present we make no claims and offer no proof of that indication.

It is wise to keep in mind here that the main objective is the measurement of a specific fundamental skill in the activities mentioned.

Fourth, to tests that would make it possible for the student to acquire a fair and reasonable evaluation of her ability, and to have some knowledge of her strong and weak points.

Fifth, to tests that might act as a motivation toward practice in the game skills.

Sixth, with consideration for the time and energy of the instructor in giving the tests, to tests that allow for ease in administration, tests that take the least time and that involve no elaborate apparatus; to tests that utilize markings and equipment already on the field or court; or, when necessary, to use a minimum of extra markings.

Tests that require elaborate diagrams, and markings that would make it doubtful if the tests would be used continuously or at least periodically were ruled out. Even so, certain minimum lines were found to be essential. If the tests are given only to classes in the particular games for which the tests are designated, this problem will be minimized.

Within these limitations tests were set up in each sport, which provide, as nearly as possible, objective measurement of a specific fundamental skill.

SINCE the largest number of records was returned in the basketball tests, these will be used as an illustration of the principles of selection which were used.

1. In the basketball tests, for instance, jump and reach was included

because the ability to jump and reach is a fundamental skill desirable in the game of basketball. It is of value for forwards, guards, and centers, whether it is used to intercept passes, to recover rebounds from the backboard, or to jump for tie balls.

2. Goal shooting for one minute was included because this brings in the element of shooting baskets against a handicap which in this instance is time. (In spite of the fact that an element of fatigue appears in a full minute of shooting baskets, this amount of time seems necessary in order to include a period of adjustment and satisfaction to the contestant.)

This test also involves footwork, hand-eye coordination, and keen alertness, as well as accuracy of aim. Since all players should have the satisfaction and experience of shooting baskets, this test appears to be valuable for all players, guards and centers as well as forwards. A knowledge of goal shooting should make for better passes from the centers to the forwards in the game, and for more intelligent guarding.

A second person was not introduced as a guard or a third person to pass to the contestant shooting for basket because if other persons were involved identical test procedure would not then be available.

3. Pass and pivot was included because the reaction time of catching a ball and immediately moving in a new direction is a skill that needs to be developed.

The test as now set up includes throwing and catching, front and rear turns with alternate pivoting to left and right.

4. Pivot and bounce for distance was included because every player needs the control necessary to cover distance on the bounce.

The reason for adding the total of three bounces in any one trial is for the sake of consistent performance, as opposed to one unusual and lucky execution.

This test would be improved by having the ball thrown to the contestant but as that would involve another person it was ruled out, and the test is started at the point where the player has the ball in her possession.

5. Push pass for speed and accuracy was included because of its simplicity. The two-hand chest pass, even if infrequently used in the game, makes for the easiest control in this type of test. Ball handling, catching, and throwing quickly and accurately require alternate relaxation and controlled tension.

6. Pass for accuracy was included as a test for the accurate throwing of overhand and underhand passes for a twenty-foot distance.

The height of the target for both of these tests was established as the approximate chest height of the average player.

7. Basketball throw for distance was included, not because players should throw impossibly long passes in a game, but because the test

records in this event seem to indicate that the more skilled basketball players do score better records on a throw for distance. This ability seems to be lacking in the less skilled players.

In other words, a player who can throw a basketball over fifty feet can usually be counted on to throw controlled, accurate passes to a teammate in a game. The mere fact of her ability to throw long passes does not mean that she will always be using them in a game situation.

8. The run and catch may also be included in the battery of basketball tests if the varied elements of ball and body control, quick starting and stopping, change of direction and pace, and the use of the juggle offset the disadvantages of having the contestant run with the ball in her possession.

Lack of space prevents the giving of reasons for including the specific test elements in each of the other team game groupings. However, tests have been set up for archery, baseball, field hockey, soccer and speedball, swimming, and volleyball. Certain other isolated tests such as the dodging run, the dashes, and the potato race have been included because it may be of interest to compare the records of college women in these tests with the achievement scales already set up for the elementary and junior high school groups.[1]

CERTAIN conclusions that may be drawn from the testing program so far are that:

The success of the testing program depends almost entirely on the attitude of the person giving the tests, the way the project is presented the first time, and the use that is made of the tests in class time throughout the season.

The tests are *most* successful when used in the sport which the class is having at the time; they are least successful when superimposed on a group that is engaged in some other activity. In other words, a swimming class will not be as interested in the basketball tests as the students in the basketball classes.

Due to the short space of time allotted for the testing program during this particular experiment, October 1 to November 15, 1934, and due to the fact that many of the tests were given to students regardless of their specific sport interest at the time, it seems rather remarkable that so many were enthusiastic about the tests. Only the finest group cooperation could make possible the return of the 18,539 cases which were available for setting up the achievement scales.

Of the twenty-six colleges and universities of the Western Society of Departments of Physical Education for College Women that co-

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[1] Neilson and Cozens, *Achievement Scales in Physical Education Activities for Boys and Girls in Elementary and Junior High School.* New York: A. S. Barnes and Co., 1934.

operated in the testing project, twenty-three institutions returned answers to the questionnaires which were sent out with the test material.

Briefly, the answers from the questionnaires show that the majority of instructors felt (1) that the students do enjoy taking the tests; (2) that the tests give the instructors an opportunity to help the poorer students diagnose their difficulties; (3) that the tests are valuable for purposes of classification of students; (4) that the tests can be used at the beginning and end of a sports season to show progress; (5) that the tests can be used as part of the grading scheme; and (6) that the tests serve as a real motivation to the students and offer specific elements for practice.

In many instances the tests in which it was more difficult to score creditably tended to be put in the dislike column. Perhaps with more time and more practice the students will realize the value of using these particular skills in the game situation. Then with greater skill will come an added interest in the test itself.

SEVERAL questions have been asked about the interpretations of the test results.

"If the tests are designed to test learning must there be a test when the individual is beginning the sport and after she has learned something regarding it?"

The same test given at the later time will show the progress made—i.e., it will be a test of learning.

"Is there any provision for indication whether the student is a novice or has had some training in the game or in the elements of the game?"

It seems that the records made in the test do definitely classify the student's achievement—i.e., the score made by the contestant indicates whether she is a novice or an advanced player.

In any activity involving menti-motor skill, certain elements must be mastered. A beginner *is* a novice whether she is nine years of age or twelve or eighteen or more adult. If these fundamental elements are an integral part of the game, then a beginner of any age will probably achieve less than a more experienced player, whatever the age difference may be.

"Is there to be any comparison made of one school against another school—in other words, will our *hasty* efforts (with unpicked groups) be used as a criterion of our teaching here?"

And of course the answer to that question was "no." Names of the instructors who gave the tests were requested only that due credit might be given to all those who helped in any way.

WITH our own longer experimentation with these achievement tests for college women at the University of California at Los Angeles we found:

First, that the tests do provide an incentive for improvement. It appears that practice with attention to specialized analysis of each particular skill *does* have a positive effect on performance. If success accompanies effort, more practice ensues. Naturally, the instructor will endeavor to facilitate this success.

Second, that motivation is increased *as soon as the students have some established records for comparison*, that they are unbelievably encouraged and enthusiastic when they find they have made real improvement over a previous record. The student appreciates knowing definitely the specific skill in which she is proficient and is often not conscious of her skill deficiencies until a definite record is available. (If desired, the tests can be utilized by the instructor to denote what the class has actually achieved, not what she *thinks* has been learned.)

Third, we have found that the tests do have value for classification purposes (showing stage or measure achievement—grouping students as beginning, intermediate, and advanced). If the beginning and advanced students are in the same class, then additional help can be given early in the season to the ones who most need help. In this way improvement may be more rapid.

Fourth, despite some claims that objective measurement is no better than subjective, we have found that objective measurement will at least verify for the student the expert's (the instructor's) rating.

Fifth, we found that the most successful results were obtained when the tests were used (with discretion of course) at the beginning of the season to show exactly what the student's achievement was when she began the class, and again about a month later to show progress. The second time we did not attempt to give three trials in all events because of lack of time.

If the tests are to be used as a grading device, then they should be given again at the end of the season.

IN conclusion, we have found in giving the tests that after the student becomes familiar with the test, after she has been given specific analytical help and encouragement, after she compares her own achievement with someone's else or with her own previous performance, she is quite definitely motivated and desires to better her record.

Also, the indication seems to be that the composite scale scores of a battery of the tests in any one activity give an index of the student's playing ability in that sport. A number of reports from various instructors in the field indicate that the composite scores also correlate very highly with the instructor's subjective grading.

Physiological Background of Professional Students Expecting to Major in the Therapeutic Field*

By Howard E. Hamlin

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LIVING organisms are great laboratories where a multitude of physical and chemical processes are constantly taking place. To this the human body is no exception. It is the objective of our course in Physiology of Exercise to humanize the subject matter as far as possible. Instead of the students in physical education learning their physiology from frogs and turtles, we are attempting to have them learn it from their own bodies. With the many methods and gadgets for the study of human physiology available, it has been possible to devote our six hours of laboratory work per week mainly to the study of physiological phenomena of the human body during rest and exercise. This gives to these students an objective picture of the ways in which muscular exercise modifies human physiology. Such information will help these students to answer their own questions as well as those which their students will ask them as to what good is to come from the regular participation in play and games.

It is true that the following outline of our course will show in its list of experiments a great similarity to the content of courses in medical physiology. But why not? Exercise modifies the physiological picture in many ways just as does disease. The same methods of study give us a picture of what is occurring in the body during exercise. There is no real reason why the medical profession should have a monopoly on these methods. In fact, such acquaintance with the tools of physicians on the part of our students of physical education and therapeutics ought to lead to a closer cooperation and understanding between physicians and physical educators.

The purpose of the elaborate studies on blood, blood pressure, metabolism, and the changing reaction in the body fluids, is to give these students a background for better evaluation of the benefits that are to be derived from proper exercise or the harm that may come from improper or excessive exercise.

The following list of experiments constitute the present laboratory

* A paper presented before the Therapeutics Section, American Physical Education Association Convention, April, 1935, at Pittsburgh, Pa.

studies which each of the students in Physiology of Exercise perform while taking our course at Ohio State University:

Exercise I: Blood studies (before and after exercise)

a) Blood counts: Total erythrocytes, total leucocytes, differential counts, total platelets, reticulocytes.
b) Supra-vital staining technique
c) Hemoglobin studies: Methods: (1) Sahli, (2) Tallquist, (3) Newcomer, (4) Reichert and Meisel
d) Hematocrit-methods: (1) Rosahn, and (2) Wintrobe
e) Specific gravity (modified Barbour-Hamilton method)
f) Viscosity—the Hess method
g) Coagulation time—Howell method
h) Fragility of erythrocytes
i) Blood chemistry: (1) sugar, (2) chlorides, (3) phosphorus, (4) gases—CO_2 and O_2 (Van Slyke)

Exercise II: Blood pressure and oncometry (dog-spleen oncometry)

a) Normal blood pressure
Also determine intrathoracic and intrapulmonic pressures
b) Effect of adrenalin
c) Effect of sensory stimulation (crural nerve)
d) Effect of amyl nitrite
e) Effect of postural position
f) Effect of asphyxia
g) Effect of bilateral vagotomy—both peripheral and central stimulation
h) The effect of adrenalin after bilateral vagotomy
i) Effect of sensory stimulation after bilateral vagotomy
j) Effect of pilocarpin
k) Effect of atropin
l) Effect of hemorrhage
m) Effect of intra-venous injection of warm normal saline
n) Intra-tracheal insufflation
o) Exposure of heart—cardiac fibrillation—and stimulation of phrenic
p) Death by embolism

Exercise III: Human blood pressure and pulse studies, before and after exercise.

a) Arterial Pressure:
(1) Palpation and auscultation methods
(2) Manometric and aneroid instruments
b) Venous blood pressure
c) Human plethysmographic (blood distribution) studies
d) Human pulse studies:
(1) The H and H sphygmograph
(2) The McG sphygmograph
(3) The Dudgeon sphygmograph

Exercise IV: Cardiac Studies:

a) Gad's ox heart valve demonstration
b) Human heart sounds and their location
c) Fluoroscopic view of the human heart
d) Electro-cardiographic studies
e) Studies with the turtle heart
(1) Effect of inorganic salts on action of ventricle
(2) Effect of temperature on auricular action

(3) Vagus inhibition
  a) Stimulation of the right vagus
  b) Effect of nicotine on heart-beat, and vagus inhibition
  c) Seat of effect of nicotine; crescent stimulation

Exercise V: Tests of physical fitness:
  a) The Schneider Cardio-vascular Test
  b) Barach's Index of Physical Fitness
  c) The Michigan State Test
  d) The Harvard Standing Test. (Based on pulse and blood pressure data)
  e) Crampton's "Blood Ptosis" Test. (Based on pulse rate and blood pressure)
  f) European Malnutrition Test: Divide the cube of the sitting height in cm. by 10 wt. in gms.

Exercise VI: Basal metabolism. (Each student must come without breakfast and cigaret)

Exercise VII: Mechanical efficiency:
  a) For bicycle riding (measured on a bicycle ergometer)
  b) For chinning the bar (over- and under-hand grasp) (use movement recorder)

Exercise VIII: Energy cost of exercise:
  a) Bicycle riding
  b) The "push-up"
  c) Chinning of the bar (for both the over- and under-hand grasp)

Exercise IX: Effect of exercise on pulmonary ventilation and body temperature
  a) To be determined for each activity listed in Exercise VIII, and at the same time those activities are performed

Exercise X: Vital capacity studies—artificial respiration with spirometer.

Exercise XI: Measurement of velocity of nerve impulse (for frog sciatic nerve)
  a) Determination of the seat of fatigue (with frog)
  b) Human fatigue studies (with ergograph)

Exercise XII: Hydrogen ion determinations: before and after exercise
  a) Body fluids to be studied: saliva, blood, urine
  b) Methods:
    (1) The electrical (use Leeds and Northrup Type K-2 Potentiometer)
    (2) The Colorimetric (use the Helige colorimeter)

Equipment and Facilities Needed by Institutions Training Teachers of Health and Physical Education

REPORT OF SUBCOMMITTEE A-6 ON STANDARDS FOR FACILITIES AND EQUIPMENT, OF THE NATIONAL STUDY ON TEACHER TRAINING IN PHYSICAL EDUCATION.

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EXPLANATION

THE FOLLOWING standards are considered essential for completely equipped institutions training teachers of physical and health education for secondary schools. These standards represent the ideal to a certain extent, yet they represent less complete facilities than many of our leading institutions now have.

Since, however, certain of these standards are more essential than others, the report indicates those standards considered most essential and those considered less essential but still needed.

Certain of the facilities will pertain exclusively to the training of women teachers, certain others will pertain exclusively to the training of men teachers, and some of the facilities may be used interchangeably for both men and women.

There was some difference of opinion among the committee members as to whether these standards should be presented in one list or in separate lists for men and for women.

The plan followed presents one list but indicates by an asterisk the facilities needed for the training of men and for the training of women.

DEFINITIONS

Facilities.—Buildings and grounds and other permanent structural units or items.

Equipment.—Apparatus of various sorts, and other items which are rather permanent but movable and which are not built in features of buildings or grounds, like mats and jumping standards.

Supplies.—Items which are perishable or are usually used up each year or so and need continual replacement, like balls, nets, and first-aid supplies.

This report attempts to incorporate the suggestions of all members of the comittee. Dr. Hughes urges more detailed statements as to what constitutes adequate ventilation, lighting, and heating. The expression "standard lighting, heating, and ventilation" has been used with the intention that latest standards in these respective fields will be met.

Professor Englehardt suggested a functional classification of facilities, equipment, and supplies. He suggested the preparation of typical layouts for each type of room showing a fair, good, and excellent layout, and submitted a sample. This provision of sample pictorial layouts seems worthy of future careful consideration.

The plan of grouping standards implies a functional subdivision of the standards, thus equipment and supplies are listed in conjunction with the facilities with which they will be used.

The problem of indicating the amounts of each item needed in relation to number of individuals served has not been adequately treated partly because methods of use vary so that it is difficult to set definite standards. However, an attempt, which should be regarded as tentative, has been made to do this.

STATEMENT OF STANDARDS

I. INDOOR ITEMS	Essential	Separate for men	Separate for women	May be used by both men and women
1. *Lecture Rooms:*				
Sufficient number to handle all classes meeting at one hour	xx			x
Readily accessible to gymnasia	xx			x
At least one room equipped with opaque shades, light outlets and screen for visual instruction	xx			x
An additional room for each additional 100 student majors	xx			x
Window area at least 25 per cent of floor area	xx			x
Artificial light adequate for night work	xx			x
At least ten running feet of blackboard space	x			x
Cross ventilation	x			x
Equipment:				
Instructors flat-top desk, and chair	xx			x
Small table	x			x
Movable armchairs	xx			x
Projector for slides and photographs	x			x
Moving-picture projector	x			x
Film-strip projector	x			x

	Essential	Separate for men	Separate for women	May be used by both men and women
Supplies:				
Erasers and chalk	xx			x
Visual instruction material as needed	xx			x
Charts, manikins, etc., as needed	xx			x
2. *Science Laboratories:*				
Facilities, equipment, and supplies for instruction in the natural sciences required in the curriculum should meet the standards of the local association of colleges	xx			x
3. *Clubroom:*				
At least one clubroom	xx	x	x	
Minimum size four hundred square feet floor area	xx	x	x	
Standard lighting, heating, ventilation	xx	x	x	
In or accessible to gymnasium building	xx	x	x	
Kitchen or kitchenette attached or easily accessible	x		x	x
Closet for wraps and supplies	x			x
Accessible toilet facilities	xx	x	x	
Smooth floor	x			
Fireplace	x			
Equipment:				
Minimum of twenty folding chairs	xx			
Couch	x		x	
Occasional chairs	xx	x	x	
Piano or radio-victrola	x		x	
Table and chair	xx	x	x	
4. *Kitchen or Kitchenette:*				
At least one available to majors and easily accessible	x			x
Equipment:				
Stove or gas plate	xx			x
Sink	xx			x
Hot and cold running water	x			x
Cupboards	xx			x
Dishes and silverware	x			x
Refrigerator	x			x
5. *Restroom:*				
Restroom adjacent to examination room and accessible to exercise floor or to corrective unit	xx	x	x	
Standard lighting, heating, ventilation	xx	x	x	
Neutral shade walls	x	x	x	
Wood floor	x	x	x	
Equipment:				
Cots, minimum of five with one additional for each twenty students in largest activity class	xx	x	x	
Light mattresses, blankets, pillows, sheets, covers	xx	x	x	
Small desk and chair	x	x	x	
Window shades	xx	x	x	

	Essential	Separate for men	Separate for women	May be used by both men and women
6. *Instructors' Offices:*				
At least one office, minimum size ten by twelve, and one additional office for each additional instructor over two in the department	xx	x	x	
Closet	x	x	x	
Standard lighting, ventilation, heating, and sanitation	xx	x	x	
Accessible to gymnasium rooms and instructors dressing- and shower-rooms	xx	x	x	
Equipment:				
Desk and chair for each instructor	xx	x	x	
Filing cabinet	xx	x	x	
Book case	xx	x	x	
At least two extra chairs	x	x	x	
Waste-paper baskets	xx	x	x	
7. *Health Examination Room:*				
Minimum size ten feet by twenty-two feet	xx			x
Basin with running hot and cold water	xx			x
Storage closet or built-in cabinet	xx			x
Standard lighting, ventilation, heating, and sanitation	xx			x
Wall outlets	xx			x
Two or more adjacent private examining rooms	x			x
Adjacent and opening into other room as classroom, restroom, office	x			x
Equipment:				
Single hospital bed	xx			x
First-aid supplies and cabinet	xx	x	x	
Desk and chair	xx			x
At least six additional chairs	x			x
One or more folding screens five feet high	x		x	x
Filing cabinet	xx			x
Supplies, charts, and equipment for complete physical examination	xx			x
Full-length mirror	xx			x
Table and two chairs in private rooms if provided	xx			x
Supplies:				
All supplies commonly used in taking complete physical examinations unless such examinations given in separate health service quarters (Morrison and Chenoweth, *Normal and Elementary Physical Diagnosis*, Chap. II)	xx			x
8. *Supply-Room:*				
Minimum floor area, sixty feet	x	x	x	
Built-in shelves or cabinets	x	x	x	
Standard light, ventilation, and sanitation	xx	x	x	
Convenient to offices and dressing-rooms	x	x	x	

	Essential	Separate for men	Separate for women	May be used by both men and women
9. *Storeroom:*				
Minimum area 120 square feet	x			x
Built-in shelves and storage bins	x			x
Standard light and ventilation	xx			x
Accessible to gymnasium floor	x			x
Smooth floor and door plates for rolling equipment	x			x
Clothes hooks or hangers	x			x
10. *Instructor's Dressing- and Shower-Room:*				
Adjacent to or readily accessible to instructor's offices and gymnasium floor	xx	x	x	
Shower and toilet facilities	xx	x	x	
Standard lighting, heating, ventilation, and sanitation	xx	x	x	
Equipment:				
Full-length locker and bench or chair for each instructor	xx	x	x	
At least six additional lockers	x	x	x	
Shelves	x	x	x	
Coat hangers	x	x	x	
Mirror	x	x	x	
Hair-dryer	x		x	
Liquid soap or soap containers	x			
11. *Drying-Room:*				
Provisions for drying athletic uniforms	x	x		
Standard lighting and ventilation	xx	x		
Heating for rapid drying of clothes	xx	x		
Sufficient size to accommodate clothes of all participants, minimum size one hundred square feet floor area unless patented dryers are used	x	x		
Equipment:				
Racks and hangers for clothes	x	x		
12. *Athletic Equipment Storage-Room:*				
Adequate for storage of all athletic equipment for teams, minimum three hundred square feet floor area	xx	x	x	
Readily accessible by students, in or adjacent to locker-room	xx	x	x	
Standard lighting, heating, ventilation, and sanitation	xx	x	x	
Windows and doors protected and provided with locks	xx	x	x	
Dispensing window with shelf	xx	x	x	
Equipment:				
Storage shelves, bins, hangers, sufficient in amount and kind to keep in good order and condition	xx	x	x	
13. *Gymnasium Room:*				
At least one gymnasium floor available for class use as needed	xx			x

	Essential	Separate for men	Separate for women	May be used by both men and women
Minimum floor area seventy feet by one hundred feet with twenty-two foot ceiling height from floor to lowest beam	xx			x
Separate individual floor for each class meeting at one hour	xx			x
Maple or other hardwood floor	xx			x
Standard lighting and ventilation	xx			x
Window area at least 25 per cent of floor area	xx			x
Windows easily opened full width	xx			x
Windows screened inside	xx			x
Solid walls of neutral shade and smooth finish	x			x
Radiators recessed if lower than seven-foot level	x			x
Skylights, if used, protected by non-glare shades	x			x
Hand, hanging, or movable apparatus cared for in storage-rooms or special activity room and not on gymnasium walls	xx			x
Provisions for spectators in one gymnasium room, balcony seating arrangements preferred to bleachers	xx			x
Approved exits	xx			x
Separate entrances for spectators	xx			x
Accessible to students and public with provision for incoming and outgoing traffic	xx			x
Readily accessible to locker-rooms	xx			x
Removed from lecture and examination rooms	x			x
Good acoustics	x			x
Game lines for basketball, indoor baseball, volleyball, and tennis	xx			x
Drinking fountain, at least one	x			x
Four wall cuspidors	x	x		
Six to eight basketball goals	xx			x
Built-in bulletin board	x	x	x	
Apparatus strip if no special activity room provided				
Equipment:				
See special activity room for heavy apparatus				x
Mat trucks or truck racks preferred to wall hangers, equivalent of one five-foot by eight-foot mat to each eight students in largest class				
Mat covers	x		x	x
Jumping standards, at least four	x			x
Movable blackboard	x			x
Movable mirror	x			x
Piano and bench	xx			x
Indoor baseballs, twelve	x	x	x	
Basketballs, eight	x	x	x	
Volleyballs, four	x	x	x	
Handballs, twelve	x	x		
Sportballs (twenty-four-inch), two	x			x
Bean bags, eight	x		x	
Indoor baseball bats, six	x	x	x	
Team markers (ribbons or pinnies), twelve	x	x	x	

	Essential	Separate for men	Separate for women	May be used by both men and women
14. *Special Activity Room (Apparatus Gymnasium):*				
A smaller floor for use with heavy apparatus and as an additional gymnasium floor, minimum size thirty-feet by forty-feet with eighteen-foot clear ceiling height	x			x
Features of construction corresponding to main room	xx			x
If this room is separated from main floor by folding partitions they should close entire space to ceiling	xx			x
Apparatus strip	x			x
Apparatus suspended or movable leaving floor clear, and walls clear as far as possible	xx			x
Two to four basketball goals	x			x
Bulletin board	x			x
Equipment:				
Mats, one five-feet by eight-feet to each eight students in largest class	x			x
Mat hangers	x			x
Horse	x			x
Parallel bars, one	x	x		x
Combination horizontal and vertical ladder, one	x			x
Vaulting bar, two	x			x
Buck, one	x			x
Springboard, two	x			x
Balance beam, two	x			x
Climbing ropes, four	x			x
Stall bars and benches, four units	x			x
Boom, one	x			x
Window ladder, one	x			x
Flying rings, one pair	x		x	x
Radio-victrola	x		x	x
Hand apparatus, movable storage cabinet unless stored in storage room	xx			
Indian clubs, twenty-four pair, one lb. each	x			x
Dumb-bells, twenty-four pair, three-quarter lb. each	x			x
Wands, twenty-four	x			x
15. *Corrective Physical Education Room:*				
A room for individual activity and instruction, minimum size twenty feet by thirty feet, ceiling height twelve feet	xx	x	x	
Connected restroom	x	x	x	
Connected office and examining room, unless adjacent to restrooms and offices previously listed	xx	x	x	
Standard lighting, heating, ventilation	xx	x	x	
Connected shower-, dressing-, and toilet-rooms for use only by students in corrective work	x	x	x	
Storage closet	xx	x	x	
Equipment:				
Standard equipment in office, restroom, dressing-rooms if provided	xx	x	x	

	Essential	Separate for men	Separate for women	May be used by both men and women
Full-length mirror	xx	x	x	
Combination wall weights	x	x	x	
Balance beam	x	x	x	
Punching bags and drums	x	x	x	
Flying rings, individual adjustment	x	x	x	
Massage plinth				
Climbing ropes	x	x	x	
Rowing machine	x	x	x	
Pedograph (for making footprints)	x		x	
Silhouettograph	xx		x	
Frictional resistance machine	x			
Nautical wheel	x			
Double wrist machine	x			
Quarter circle and pulley weight	x			
Corrective mats, at least ten, three feet by six feet	xx	x	x	
Mat truck	x	x	x	
Stall bars and benches, three sections	xx	x	x	
Combined inclined and horizontal ladder	x	x	x	
Suspended barrel	x	x	x	
Inclined plane	x	x	x	
Wall parallel bar	x	x	x	
Vaulting bar	x	x	x	
Scales	x	x	x	
Filing cabinet	x	x	x	
Volley balls and net	x	x	x	
Volleyball floor marking	x	x	x	
Extra stall-bar benches	x	x	x	
Victrola and records	x	x	x	
Posture and other posters	xx	x	x	
First-aid cabinet and supplies	x	x	x	
Medicine balls, two four-pound, two eight-pound	x		x	
Medicine balls, two six-pound, two twelve-pound	x		x	
Bean bags	x		x	
Dumb-bells, Indian clubs, and wands if not previously provided	x	x	x	
16. *Library:*				
A library and reading-room, minimum fifteen feet by twenty-four feet	xx			x
Standard lighting, ventilation, and heating	xx			x
Provision of control of books through main office	x			x
Equipment:				
Reading tables, two	x			x
Table lamps, two	x			x
Chairs, twelve to fifteen	xx			x
Bookshelves	xx			x
Magazine racks	x			x
Small table and chair	x			x
Display rack	x			x
Catalog cases	xx			x
Comprehensive selection of books and magazines on physical education	xx	x	x	x

	Essential	Separate for men	Separate for women	May be used by both men and women
17. *Administrative Offices:*				
A suite of administrative offices	xx	x	x	
Reception area	xx			x
Counter	x	x	x	
Director's office and conference room	x	x	x	
Preferably in connection with library room	x			x
May be in connection with examination rooms	x	x	x	
Equipment:				
Desks, chairs, filing cabinets, typewriter and table, and complete office equipment	xx	x	x	
Bulletin board in hall	xx	x	x	
18. *Additional Activity Rooms:*				
It is recommended that additional indoor facilities be provided for archery, driving cages, tennequoits, bowling, indoor tennis, and other recreational activities (see comparable outdoor facilities)	x	x	x	
19. *Dance Studio:*				
A dance studio or second activity room for instruction in dancing for schools of five hundred or more enrollment (women)	xx		x	
Soft attractive interior finish	xx		x	
Standard lighting, heating, ventilation	xx		x	
Hardwood floor, smooth finished, kept clean	xx		x	
Provision for spectators, balcony or recessed folding bleachers	x		x	
Baseboard outlets	xx		x	
Equipment:				
Piano	xx		x	
Percussion instruments	x		x	
Spotlights	x		x	
20. *Handball Courts:*				
Handball courts (may be converted into squash courts, at least two available to P. E. majors)	xx	x		x
Four-wall courts, eighteen feet by thirty-six feet, sixteen-foot ceiling height, solid walls non-glare white finish	xx	x		x
Flush door	xx	x		x
Recessed wall cuspidor	x	x		x
Lighting one-thousand watts located in reflectors at junction of rear wall and ceiling	xx	x		x
Cross ventilation	xx	x		x
Balcony or raised passage-way at rear of court for spectators	x	x		x
Wire mesh screening recommended in upper-half rear wall and upper fourth of back three-quarters of side walls	x	x		x
All windows flush screened inside with stiff wire grating three-quarter-inch mesh, hinged or with opening for adjustment of windows	xx	x		x

	Essential	Separate for men	Separate for women	May be used by both men and women
One wall court, at least one in gymnasium or other room fifteen feet by thirty feet by sixteen feet ceiling height	x			x
Three-wall courts	x			x
Regulation court markings	xx	x	x	x
21. *Boxing-Room:*				
A room especially for boxing in institutions of one thousand men or more, minimum floor area twenty-five feet by forty feet	xx	x		
Standard lighting, heating	xx	x		
Cross ventilation, windows or open walls 25 per cent of floor area	x	x		
Smooth finish walls	x	x		
Wall mats six feet high	x	x		
Punching bag drums, two	xx	x		
Bulletin board	x	x		
Equipment:				
Storage cabinets for gloves, galvanized wire screen cubby-hole style, locked door, provision for forty pairs of gloves	xx	x		
Punching bags (light), four	xx	x		
Punching bags (heavy), one	xx	x		
Boxing gloves, fifty pairs	x	x		
Skipping ropes, twelve, seven feet long	x	x		
Cuspidors, two	xx	x		
22. *Wrestling-Room:*				
A room especially for wrestling in institutions having five hundred or more men, minimum size twenty-five feet by forty feet floor area	xx	x		
Standard lighting	xx	x		
Cross ventilation	xx	x		
Window area or open walls 25 per cent of floor area	xx	x		
Smooth finish walls	xx	x		
Equipment:				
Wrestling mats, minimum two each sixteen feet by sixteen feet	xx	x		
Mat covers, four, three feet larger each way than mats	xx	x		
Cuspidors, two	xx	x		
Bulletin board	xx	x		
23. *Apparatus Storage-Room:*				
Minimum floor area 150 sq. ft. for storage of heavy apparatus, adjacent to main or apparatus gymnasium. (In smaller institutions the store-room No. 8 previously mentioned may suffice.)	xx			x
Standard lighting and ventilation	xx			x

	Essential	Separate for men	Separate for women	May be used by both men and women
24. *Locker- and Dressing-Room:*				
The dressing, locker, and shower facilities should be such as will accommodate two classes of maximum size or "peak load" plus storage space for uniforms of all students taking physical education	xx	x	x	
Standard lighting, heating, ventilation, and sanitation that will prevent obnoxious odors	xx	x	x	
Individual dressing-rooms, showers, and lockers	x		x	
Or, some arrangement space adjacent to lockers and not far removed from showers	xx	x	x	
Individual or group dressing-room walls not to exceed five feet in height, walls starting twelve inches above the floor, made of steel, wood, or marble, light in color, water-proof finish	xx	x	x	
If basket system of lockers is used dressing lockers and room should accommodate two classes of "peak" size	xx	x		
Basket plan if used should be of self-service plan preferably	xx	x		
If self-service basket plan is used the "La Porte" plan giving easy access to baskets by attendants is recommended	xx	x		
Provision for incoming and outgoing traffic	xx	x	x	
Toilets and showers in enclosed rooms separated from dressing-rooms but handy	xx	x	x	
Temperature maintained at approximately 70° F. when in use	x	x	x	
Equipment:				
Benches for "peak load"	xx	x	x	
Hair-drier, one to each fifteen users at "peak load"	xx		x	
Mirrors, four sq. ft. to each ten users	x	x	x	
25. *Lockers:*				
Each student using the physical education facilities should have a storage locker or basket for uniforms	xx	x	x	
Lockers or baskets of non-rust material or finish	xx	x	x	
Individual lockers if used to be not less than ten inches by twelve inches by thirty-six inches	xx	x	x	
Baskets or storage boxes to be at least ten inches by fourteen inches by eight inches	xx	x	x	
Whatever type of locker provided should be such that an attendant can get immediate access by master key or other arrangement	xx	x	x	
System of ventilation and heating allowing flow of air through lockers and such as to dry uniforms in six hours	xx	x	x	
26. *Shower-Room:*				
Shower-room to provide one shower to each three users	xx	x	x	

	Essential	Separate for men	Separate for women	May be used by both men and women
Minimum floor area of individual shower-rooms four feet by four feet	xx		x	
Minimum floor area of group shower-rooms to be twenty feet by twenty feet for each sixty users at "peak load," and containing fifteen shower heads	xx	x	x	
Shower heads located on side walls at six-foot height	xx	x	x	
Shower heads in individual booths to be directed away from door openings	xx	x	x	
Each shower to have individual control with direct hot and cold water lines	xx	x	x	
Gang showers can be used but not recommended	x	x	x	
Floors of non-slip water-proof material	xx	x	x	
Drainage to sides with three-inch troughs and drains sufficient to prevent standing water at any time	xx	x	x	
Lighting, fifty watts to each forty sq. ft. of floor area	xx	x	x	
Walls smooth, hard finish, light color	xx	x	x	
Liquid soap tank and outlets to each shower	x	x	x	
Soap containers accessible to each shower	xx	x	x	
No exposed piping below eight-foot height	xx	x	x	
Foot bath at exit from shower-room	xx	x	x	
If individual showers used, wet and dry aisles recommended	x	x	x	
Drying-room adjacent to group shower-room	xx	x	x	
Hair-driers in drying-room unless located in dressing-room	xx		x	
Provision of circulating of users from locker- and dressing-rooms to toilets and shower-rooms	xx	x	x	
Drinking fountain outside but adjacent to shower-, locker-, and dressing-room	xx	x	x	
Spittoon next to drinking fountain built-in, flushing type recommended	xx	x	x	
Ventilation sufficient to carry out all vapor away from locker-rooms				
27. *Toilets:*				
Toilets located in individual toilet and washroom partitioned off from shower- and dressing-rooms with accommodations for a "peak load"	xx	x	x	
One seat to each twenty students at "peak load," minimum of four	xx	x	x	
One urinal to each fifteen men in largest class, minimum of four	xx	x		
Liquid soap outlets	x	x	x	
Paper hand-towel dispensers	xx	x	x	
In large locker-rooms, shower-, drying-, and toilet-rooms in two units preferable to consolidation in one unit	xx	x	x	

	Essential	Separate for men	Separate for women	May be used by both men and women
Janitor's closet with storage shelves, running hot and cold water, janitors supplies	xx	x	x	
Outside light, large windows, through ventilation, standard heating	xx	x	x	
Cement tiled, or terrazzo floors with slope to floor drain, non-slip floor finish	xx	x	x	
Wash basins, minimum of 2, with 8 for "peak load" of 120 users	xx	x	x	
Mirrors width of wash basins recessed in wall over basins	xx	x	x	
Lighting, fifty watts to each forty sq. ft. floor area	xx	x	x	
House bib.	xx	x	x	
28. *Towel Storage and Dispensing Room:*				
Towel dispensing room in or readily accessible to path of students to showers	xx	x	x	
Service counter	xx	x	x	
Screen upper walls recommended	x	x	x	
Separate window or chute for soiled towels	xx	x	x	
Storage shelves	xx	x	x	
Equipment:				
Soiled towel baskets, two	x	x	x	
Towels, five hundred to each thousand users	xx	x	x	
29. *Laundry:*				
Unless commercial laundries used, provision should be made for laundering suits and towels	x			x
30. *Swimming Pool:*				
Pool may be open air in warm climates but hardly satisfactory	xx			x
Minimum size thirty-five feet by seventy-five feet, depth three feet six inches to nine feet or more	xx			x
Pool floor to slope gradually to not over five-foot depth for two-thirds of its length	xx			x
Pool runways on each side not less than five-foot width, non-slip surface, to increase with size of pool	xx			x
Minimum width of runway behind deep end fifteen feet	xx			x
Surface draining of water into scum gutter	xx			x
Combined scum gutter and hand rail terra-cotta trim around pool, water surface one foot below pool runway	xx			x
Top of pool curb one foot wide and two inches above runway with drains from runway into scum-gutter drain pipes	xx			x
Recessed, wide step, non-corrosive ladders with hand rail in each corner of pool	xx			x
Head room above highest spring board of at least twelve feet	xx			x

	Essential	Separate for men	Separate for women	May be used by both men and women
Entrance to pool only through shower-room with liquid soap, hot and cold water	xx			x
Foot bath at entrance and exit to pool	xx			x
No exposed hot pipes or radiators	xx			x
Window area at least 25 per cent of poolroom floor area	xx			x
Lanes and depth figures painted on	xx			x
Standard lighting	xx			x
Submerged lights in pool	x			x
Abundant ventilation, without direct draft on swimmers	xx			x
Temperature of poolroom kept between 70° F. and 75° F. except where outdoor temperature is 60° F. or above	xx			x
Temperature of water in pool 65° F. to 72° F.	xx			x
Thermostatic control of temperature of poolroom and water	x			x
Toilet-room opening into poolroom	xx			x
Small dressing-room opening into poolroom	x	x	x	
When pool is used by both men and women separate entrances and exits, showers, toilets, and dressing-rooms provided	xx	x	x	
Provisions for filling and emptying pool, heating water, filtration, and purification of water, with turnover ratio of two to four	xx			x
Pressure filters, minimum of two in a battery, with provision for chlorinating water and adding alum and copper sulphate as needed. Water kept clear enough to see six-inch black disk on bottom	xx			x
Intermittent disinfection of water with hypochlorites not recommended	x			x
Spectators' balcony with seating arrangement of at least two hundred and above to 10 per cent of enrollment with full vision of water surface, and separate entrance for spectators outside poolroom, with exits as required by local laws, adequate ventilation	xx			x
Skylights, if used, curtained	x			x
Equipment:				
At least one spring board unit with board three feet above water, at deep end	xx			x
One spring board ten feet above water where depth of water (nine feet) and ceiling height (twenty-two feet) permit, at deep end	xx			x
High board to have platform with hand rail, and wide step ladder	xx			x
Adjustable fulcrum boards preferred	x			x
Boards to be standard intercollegiate boards, one piece, properly tapered, sand or cocoa matting covered	xx			x

	Essential	Separate for men	Separate for women	May be used by both men and women
Pole hooks, ropes, and other life-saving equipment in poolroom	xx			x
Towel hooks	xx			x
Flutter boards, ten to twenty	x			x
Small table	x			x
Folding chairs, ten to twenty	x			x
Cleaning and scrubbing brushes, suction brush for cleaning bottom of pool	xx			x
31. *Swimming Instructor's Office:*				
Minimum size eight feet by ten feet, preferably at end of poolroom	xx	x	x	
Glass partition above three feet above floor on pool side allowing clear view of poolroom	xx	x	x	
Table and chairs	xx	x	x	
Couch	xx	x	x	
Filing cabinet	xx	x	x	
First-aid container and supplies	xx			x
When pool is used by both men and women separate adjacent offices should be provided	xx	x	x	
Instructors' dressing- and shower-room adjacent to office and opening into office and poolroom	xx	x	x	
32. *Pool Locker- and Shower-Room:*				
Where pool is some distance from dressing-rooms additional locker-, dressing-, and shower-rooms should be provided in connection with the pool	x	x	x	
With individual locker-, dressing-, and shower-rooms, wet and dry aisles provided	x	x	x	
Foot bath at entrance and exit of locker-room	xx	x	x	
Connected toilet-room	xx	x	x	
Towel and suit dispensing booth	xx	x	x	
Equipment:				
Mirrors	xx	x	x	
Towels	xx	x	x	
Cotton one-piece suits	xx		x	

II. OUTDOOR FACILITIES

Certain types of physical education activities should and must be carried on outdoors. Fields and courts of various sizes and surfaces according to the nature of the activity are imperative.

33. *Basketball Courts:*				
Minimum size forty-five feet by eighty feet plus five feet of side and end space	x	x	x	
Surfaced for good drainage	xx	x	x	
Slope two inches in fifty feet	x	x	x	
Permanent lines marked	x	x	x	
Good basketball back stops and goals	xx	x	x	
Courts running north and south	x	x	x	

	Essential	Separate for men	Separate for women	May be used by both men and women
34. *Handball Courts:*				
Size twenty feet by thirty-six feet plus additional side and end space for one-wall courts	x			x
Solid front wall, eighteen feet high	xx			x
Walls of concrete or tongue and grooved wood, painted white	x			x
Hard surfaced or wood flooring	xx			x
Painted lines	xx			x
Slope for rapid drainage, two inches in fifty feet	x			x
Running north and south	x			x
Three-wall or four-wall courts preferred	x			x
35. *Tennis Courts:*				
Size 36 feet by 78 feet, total width 50 feet, total length 120 feet surfaced area, one court to each 100 enrollment	xx			x
Slope for rapid drainage two inches in fifty feet	xx			x
Net posts with attachments for adjusting net	xx			x
Clay or other good surface with lines marked	x			x
Courts running north and south	x			x
Courts surrounded by wire fence, No. 9 chain link, two-inch mesh screen, twelve feet high, galvanized iron posts set in concrete	x			x
At least one gate	xx			x
Equipment:				
Tennis nets, cable top cord, tarred	xx			x
36. *Volleyball Courts:*				
Size thirty feet by sixty feet with four-foot area on each side, entire area surfaced, lines marked, slope two inches in fifty feet for drainage, at least two available	x			x
Posts, metal or wooden (four inches by four inches), eight feet six inches above ground, two feet six inches below ground, set in concrete boxes	xx			x
Courts running north and south	x			x
Equipment:				
Volleyball nets	xx			x
Volleyballs, four for each class of twenty-four	xx			x
37. *Playgroundball Diamonds:*				
Size 45 feet by 45 feet, field limit 135 feet, at least 2 available	xx			x
May be superimposed on some other field or area	x			x
Surface, clay dirt or turf (preferred)	x			x
Home plate in northeast corner	x			x
Backstop ten feet high by twenty feet long curved twenty feet behind home plate	x			x
Equipment:				
Playground balls (twelve-inch) and bats, twelve balls and six bats minimum	xx			x

	Essential	Separate for men	Separate for women	May be used by both men and women
38. *Field Hockey Field:*				
Field hockey, speedball, and soccer may be played on same field with separate or adjustable goals	x			x
Size, fifty to sixty yards wide by ninety to one hundred yards long (minimum forty-five by eighty yds.) good turf, field running north and south, standard goals	xx			x
Watering and drainage system	xx			x
Surface approximately level, lines marked	xx			x
Equipment:				
Hockey balls, four for twenty-four students in class				
Hockey sticks, twenty-four, eighteen to twenty-one oz.				
39. *Soccer Field:*				
Size and specifications as for hockey field	xx			x
Standard goals and markings may be superimposed on hockey field				
Equipment:				
Goals	xx			x
Corner markers	x			x
Soccer balls, four for each twenty-four students in class	xx			x
Shin guards, twenty-four	x		x	
40. *Speedball Field:*				
May be same as for hockey, soccer or football (preferred)	xx			x
Standard goals, and marking	xx			x
Equipment:				
Soccer balls can be used	xx			x
41. *Baseball Field:*				
Baseball field of standard size and construction, 235 feet field distance	xx	x		
Stands for spectators	x	x		
May be superimposed on football field	x	x		
Equipment:				
Baseball, twelve for each class	xx	x		
Bats, six for each class	xx	x		
Catcher's mitt and protectors	xx	x		
42. *Football Field:*				
One standard football field, good turf, goals, markings	xx	x		
(Soccer, hockey, speedball may be played on football field but in large colleges at least one additional field should be provided.)	x			x
Equipment:				
Line marker	xx			x
Lime	xx			x
Roller	xx			x

	Separate	Separate for men	Separate for women	May be used by both men and women
Watering equipment	xx			x
Mower	xx			x
Ball inflator	xx	x	x	
Steel tape, one hundred feet	xx	x	x	
Timer, two	xx			x
Horns and whistles	xx	x		
Score books	xx	x	x	
43. *Track and Field:*				
A quarter-mile running track enclosing a field for field events	xx			x
Track to have good base and crushed cinder top dressing, at least five lanes wide, with distances marked	xx			x
High-jump pit twelve feet by twelve feet filled eighteen inches deep with sawdust, fine sand or loose soil	xx			x
Pole-vault pit twelve feet by twelve feet	xx			x
Shot-put circle	xx			x
Discus circle	xx			x
Javelin-throw lane	xx			x
Equipment:				
Standard equipment for each event (see "Report of Committee on Gymnasium and Athletic Field Equipment of A. P. E. A.," 1934)	xx			x
44. *Archery Lanes:*				
Size ten feet by one hundred feet; good target of standard make; safe; turf	x		x	x
45. *Croquet Court:*				
Size thirty feet by sixty feet; turf or ground well prepared; level; boundary limits marked	x		x	
46. *Golf-Driving Cages:*				
Size ten feet by twelve feet; height twelve feet; constructed of steel frame and small mesh wire; canvas drop at back; good tee	x			x
47. *Golf Putting Greens:*				
Size 5,000 square feet for nine holes; standard turf; standard cups; surrounded by good fence	x			x
48. *Horseshoe Courts:*				
Size thirty feet between pegs; iron pegs; pitch board frame around peg six feet by six feet; pitcher's box filled with damp clay six inches deep; court on level ground; ten feet between different courts; ten feet of extra space at end of each court	x			x

BOOK REVIEWS

THE CURRICULUM IN SPORTS (Physical Education). Seward C. Staley, Ph.D. (W. B. Saunders Co., Philadelphia, 1935) 373 pages. $2.50.

The chief purpose of the present text is to deal with the essential features of that division of the school curriculum currently called physical education. To orientate the reader with this phase of the school curriculum, the author proceeds to answer in his opening chapter, "The Educational Philosophy," these fundamental questions: What is the nature and purpose of education? What is the all-inclusive objective of education? What is the function of the school? What is the curriculum? How is a curriculum constructed?

Professor Staley is convinced that the curriculum ("an actual course of instruction or learning") is unquestionably the basic program in the five-fold program that a modern school promotes. He interprets the curriculum to be comprised of the following four items: (1) conduct (or ultimate) objectives, (2) control (or immediate) objectives, (3) learning activities, and (4) materials of learning.

Much of the material in the first chapter is either an adaptation or interpretation, or a quotation of that which appears in the classic *Reconstruction of the Secondary School Curriculum: Its Meaning and Trends* by W. S. Monroe and M. E. Herriott.

To find the activities that should be included in the curriculum commonly designated as physical education, the author deems it necessary to review the significant programs in the history of physical education and to relate their status in current practice. As important as this material may be to students of physical education, the reviewer thinks it could just as well have been omitted. By and large, many students studying physical education and most teachers in this field, if not already acquainted with the writers (Leonard, Wood, Hetherington, Williams, Nash, Sharman, *et al.*) and their leading works from which the author quotes or to which he frequently refers will no doubt, early in their career, become acquainted with them.

From a very early time in the history of man, it seems that the human organism was conceived as a compound of two or more attributes and that life was a composite of at least two qualities. Educators, throughout the ages, have been dominated by this fundamental theory and consequently have held a corresponding dualistic or trilogistic concept of education.

Today, educators, leaders of human conduct, conceive of the individual as an indivisible, integrated, behaving personality. They aim to develop the whole child. (This concept of monism in spite of earlier leanings did not achieve real significance until about the time of the philosophical reign of Spinoza, who is usually credited with its establishment.)

If this modern monistic-behavior concept is to be adopted, then there cannot be, maintains Dr. Staley, a distinctive and independent education of the body or of the mind or of the spirit. Consequently, there cannot be a *"physical" education.* Not that the program carried on under this heading should be abandoned, points out the author, but the title should, for it is inappropriate and misleading.

Left without a name for this chosen profession, Professor Staley searches for a new one. He discusses the merits and demerits of several suggested titles, among which are: vigorous play activities, big-muscle activities, play, recreation, health, character, gymnastics, athletics, and sports. The author tries to convince the reader that the designation

"Sports" or Sports Education is more nearly satisfactory than any of the titles previously considered or suggested and hence should be adopted although he holds no brief for it. The author uses the word sports to mean "any vigorous funful (Is this in the dictionary?) activity."

It was pointed out previously that the curriculum was the core program in the modern school. After indicating the scope of the field of sports, the author devotes the latter half of his book to describing the four items comprising the curriculum and to the more essential features of that division of the school curriculum which he prefers to call sports education. He defines it as "that phase of the school curriculum which is concerned with directing children and youth in learning (participating in) socially and hygienically approved sports according to social and hygienic standards." If the curriculum in sports is to secure the space, the equipment, and the supplies it rightfully deserves, gain the respect it merits, and produce the results it should produce, Dr. Staley maintains and stresses that it must be organized and conducted at all times according to accepted educational principles and practices.

Any reader who has ever attempted to organize and conduct a concrete curriculum will readily affirm that it is no easy task. Many years of study and practical experience at the University of Illinois have aided Dr. Staley to cope with this task. He ably explains and familiarizes the reader with such theoretical matters as: interests, capacities, needs, age differences, individual differences, habits, skills, knowledges, time allotment, teachers, climatic conditions, health conditions, and social conditions. Such practical problems are discussed as: costume requirements, bathing regulations, equipment arrangement, locker provisions, attendance and time regulations, examination schedules, and the factors used in deriving final grades.

It is of interest to note that the author feels greatly that a successful curriculum hinges upon what is best for the students. To obtain the "best" school administrators should employ only those teachers who are well-trained, have all-round ability, experience, taste and interests, and who are truly professionally interested in their chosen field.

Throughout the book not only the "what" and "how" but also the "why" of things is brought out in the treatment of topics and activities. Chapters three, four, and fourteen are especially interesting. For students using this book as a text the author has included after each chapter a number of "out-of-class learning activities" which are thought-provoking and stimulating. The carefully selected bibliography of sports and the complete index also are invaluable aids.

In spite of a number of minor shortcomings, *The Curriculum in Sports (Physical Education)* is a noteworthy addition to the library of students and teachers of sports education and should be of great value to school administrators.

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The American School System. Aubrey A. Douglass. (Farrar & Rinehart, Inc., 1934) 491 pages.

Professor Aubrey A. Douglass, Head of the Department of Education, Claremont Colleges, has conducted beginning courses in education for students of varied interests. It is from these classes that this book with its simplicity of organization and non-technical language has developed.

The organization of each chapter follows a uniform plan, first stating the problem, secondly a complete and interesting discussion, and lastly questions for discussion and topics for investigation, based upon the discussion. A bibliography ends the chapter.

This book contains a very broad and inclusive description of the American school system designed especially for prospective teachers and leaders in community life.

Beginning with a description of the extent of the national school system, the book next takes up the cost of schools,

stating sources of income and the manner of expenditure, and presenting a picture of the problems of school finance and suggestions for their solution. The value of education to the younger generation and to society is described under the purpose of the educational program.

Types of education for the group before the age of six, with the purposes and organization of schools for those ages, is discussed. Separate chapters deal with elementary education, secondary education, and higher education.

All the chapters dealing with the above topics give a picture of what is being done, along with past history in its development.

A study is made of the curriculum, in which the problems confronting mankind are selected, a choice of cultural materials and an organization of the materials to facilitate learning are given. Lesson planning is dealt with under principles of method, with a description of the underlying psychological principles.

The discussion of measuring the results of instruction in which present methods of testing are examined and evaluated is complete and suggestive.

The part the school is to undertake in effecting the adjustments of those who leave school and must fit into the social order makes an interesting discourse. The organization, support, and conduct of part-time and adult education is well described, as is the education of exceptional and rural school children.

A very worth-while chapter deals with the examination of extra-curricular activities and attempts to set standards for determining their value. The program for the training of teachers appears, along with the discussion of the instructional staff and gives the prospective teacher some tangible things for consideration.

A picture of the organization and control of the school system is given before the issues that have recently or previously faced education are discussed.

Prospective teachers will find this book very helpful in gaining a broad outlook of the American system of education.

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KEEPING CAMPERS FIT. Elena E. Williams, R.N. (E. P. Dutton & Co., Inc., New York) 227 pages. $2.50.

In the gradually increasing interest in summer camps, the rôle of the nurse in camp has evidently been considered so negligible or else so apparent that it has not been of enough import for any publications. Miss Williams, as an experienced girls' camp nurse, has definitely felt the need for the distribution of some information in this regard for those who might be interested. In her book, *Keeping Campers Fit*, she has endeavored to supply this need.

The author discusses what a nurse has to know and do, the equipment needed, a nurse's personal equipment, the *materia medica* necessary to camps of various sizes, the best characteristics of a good camp nurse, and the relationship of the nurse to the camp staff. The legal responsibility of the nurse, especially where no doctor is in attendance, is particularly stressed by Miss Williams.

Health educational possibilities in the camp are considered, and the author describes the use of scheduled classes in this subject. In accordance with the newer conceptions of educational procedures in summer camps, many directors might criticize this method. Many other possibilities, however, are open to the camp nurse for the development of health educational materials, and Miss Williams' suggestions might adequately serve as a stepping stone.

As there are about eight thousand summer camps in the United States, no one book could possibly answer the needs of each nurse in every individual camp. *Keeping Campers Fit*, however, is an honest beginning and might well serve as a manual for the nurse who wishes to take up the work for the first time, and also as a guide for the nurse

who has already had some experience. Camp directors, counselors, and even parents might easily receive valuable information by reading this book.

Even if this book had accomplished nothing more than the stimulation of interest in the objectives and responsibilities of the camp nurse, and in the enjoyment which might be derived from camp experience, this end in itself would more than justify its publication.

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HEALTH EDUCATION IN AN AMERICAN CITY. Louise Franklin Bache. (Doubleday Doran and Co., Inc. 1934). 116 pages. $2.00.

This is a report of the public health education demonstration conducted over a period of eight years by the city of Syracuse, New York. Through the financial support of the Milbank Memorial Fund of New York, the city's Department of Health was enabled to establish a Bureau of Health Education. This Bureau cooperated very effectively with all the local agencies and associations in various health education projects, and also worked successfully through the schools.

But the most unusual feature of this demonstration was the work with the general public, through a variety of publicity media, comparable to those used in an advertising campaign. Health information was literally sold to the public. The local newspapers carried feature articles, editorials, pictures, and advertising, and also had special health numbers or sections. Posters, cartoons, photographs, movies, street car cards, and even billboards brought health lessons to the public eye. The Bureau issued weekly and bi-monthly bulletins, and special leaflets and booklists, and distributed them where they would do the most good. Local specialists in different health aspects were organized into a Speakers' Bureau, and many opportunities were found for the use of their services in talks to various groups, and over the radio in a weekly series. Health education was dramatized in stories, plays, pageants, and parades. Many health exhibits were used, several special campaigns were carried on, and there were various contests and publicity events. The book explains the details of all these projects, telling about the failures as well as the successes, and giving many practical hints on the conduct of a health education campaign.

Few cities could put on as ambitious a program as this, but any city, or any organization or individual interested in methods of health education outside the schools would find much of value in this book, in the way of practical suggestions on how to get your material into the public eye.

In reading a report of this type, several questions naturally come to mind, "What good did all this do?" "Is Syracuse any healthier as a result of the demonstration?" "Did the interest in health continue?" "Do the papers still carry health features?" These questions are not answered by the present publication—they are not even discussed. One can only hope that the next project will be an attempt to answer them, by a survey of present health conditions and health consciousness in the city which has had the benefit of this excellent program.

ELIZABETH NOYES
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MENTAL HEALTH, ITS PRINCIPLES AND PRACTICE. Frank E. Howard, Ph.D., and Frederick L. Patry, M.D. (Harper and Brothers, New York) 551 pages. $3.50.

A most significant evolution of stresses in physical education is now finding its natural culmination in a study of personality development in which more than lip service is being given to the widening areas of mental health with its physical interactions and inter-relationships. In this situation, the physical educator does not desire to miss the hygienic promise and possibilities which

the multitudinous formal and informal physical activities so characteristically develop. I believe the authors have herein set forth with clarity and distinction those practices and principles of mental health which will help the educator through a better understanding and more effective approach and methods.

While the emotions and sex are given more than the conventional consideration, the hygienic implications of family relationships and of childhood and youth are developed with illuminating interest. The objective psychobiology of Meyer is presented with its pregnant possibilities for new ideas and ideals, and methods are suggested for the wise utilization of educational material in the construction and reconstruction of personality. The detection and treatment of mental deviations is stressed.

For the physical educator who desires to utilize the many basic and practicable elements of mental hygiene for a more adequate understanding of himself and his students, this contribution will be found well worth while.

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DITTO PRACTICE LESSONS IN FOOTBALL. Maury A. Kent. (Chicago: Ditto, Incorporated, 1935) 116 pp. $2.50.

This book should receive a generous welcome from all football coaches and players. It will be very useful in providing an economical device by which the coach may clarify his discussions of offensive technique. The use of Ditto ink makes it possible for any page to be easily removed and reproduced in order that each player have a copy of his own. The reproductions can be made with any gelatine or hectograph duplicator. Any changes which the coach may want to make in the numerous diagrams of plays and offensive fundamentals can be written on the page with Ditto inks or pencils and thus be reproduced with the remainder of the content. Deletions may be made by crossing out with Ditto pencils.

Most successful coaches of football are now using combinations of various systems in developing their offensive tactics. However, four fundamental formations are seen commonly—single wing, double wing, short kick, and Notre Dame. The combination of these formations in offensive strategy eliminates the possibility of failure of offense when the opponents are especially adept in defense for one particular offense. The plays illustrated in this book represent a compilation of all the better known systems, and includes plays used successfully by Bierman, Crisler, Little, Shaughnessy, Spears, Thomas, Warner, and Zuppke.

A beginning coach has many problems. Getting offensive plays is not always the hardest task. The exact technique of stance, charging, blocking, reversing, spinning, fake reversing, etc., is what bothers an inexperienced coach. The first part of *Ditto Practice Lessons in Football* is intended to help the coach along these lines.

This book should be valuable to the high school and small college coach in the following ways:

1. It can form the background for the exact technique of stance, charging, blocking, reversing, spinning, fake reversing, etc., to be taught to beginners.
2. It provides a varied and sound portfolio of basic plays in the four fundamental formations which can be used either for beginners or experienced players.
3. It permits the varying of these fundamental formations to fit the particular abilities of players without having to redraw the entire formation.

L. T. HOLLWAY
Football Coach, Ann Arbor High School, Ann Arbor, Michigan.

Advanced Degrees in Physical Education at the State University of Iowa

THE degree of Doctor of Philosophy in this field has been made possible by the adoption of the policy that the graduate work shall all be of a strictly scientific nature; and that each subject is to be taught in the fields in which specialists are available. Thus, anatomy is taught by an anatomist; physiology by a physiologist; hygiene by a hygienist; and orthopedics by an orthopedist. These subjects are taught in the College of Medicine. Anthropometry is taught by an anthropometrist in the Child Welfare Research Station. Courses or researches in the chemistry of nutrition or physiological chemistry are taught by chemists; and problems involving physics are cared for by physicists. Education is taught by educators; statistics by a mathematician; and the theory and practice of physical education by masters in that field. Each teacher of subjects other than physical education in the narrower sense has studied the problems in this field and organizes his applied courses to meet the specific needs of physical education.

By this procedure departmental fences are broken down and the work is integrated in such a way as to draw upon the best facilities of the Department of Physical Education, the College of Medicine, and the College of Education.

C. E. SEASHORE,
Dean of the Graduate College
State University of Iowa.